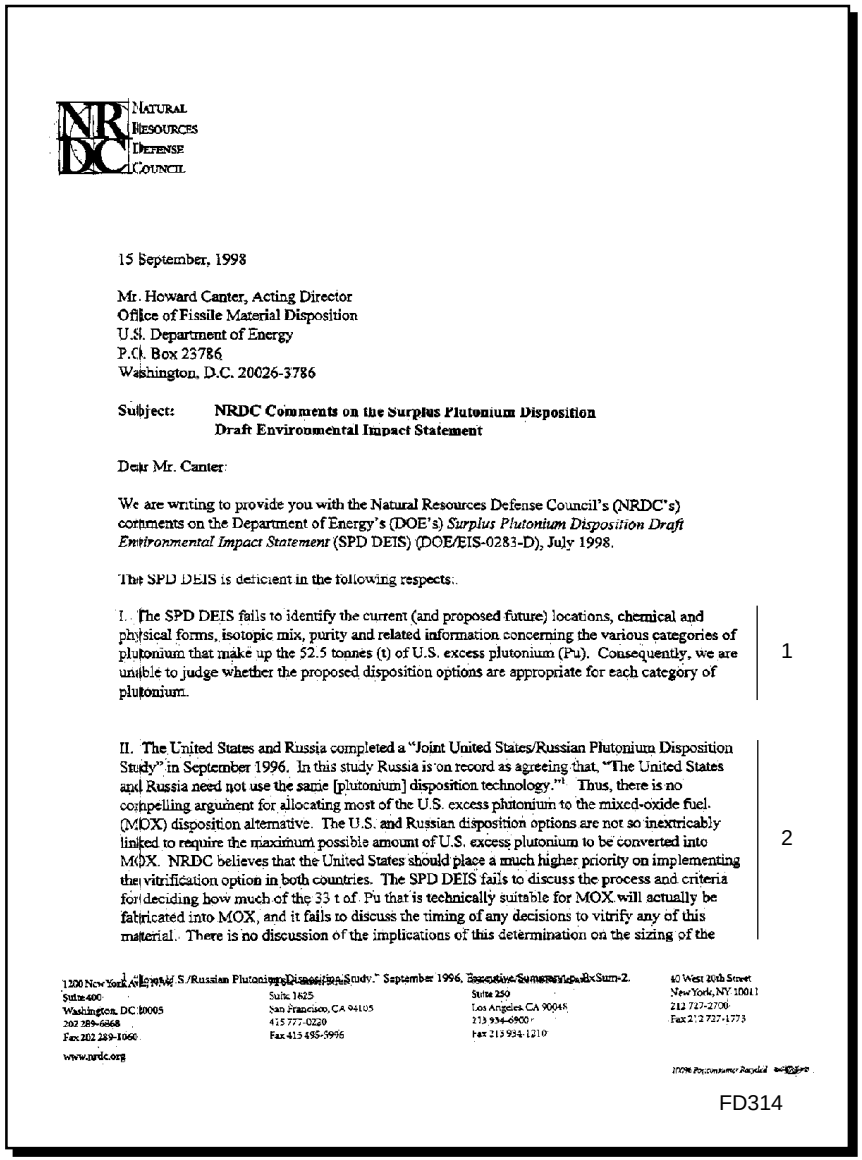

NRDC NATURAL RESOURCES DEFENSE COUNCIL

15 September, 1998

Mr. Howard Canter, Acting Director
Office of Fissile Material Disposition
U.S. Department of Energy
P.O. Box 23786
Washington, D.C. 20026-3786

Subject: NRDC Comments on the Surplus Plutonium Disposition Draft Environmental Impact Statement

Dear Mr. Canter:

We are writing to provide you with the Natural Resources Defense Council's (NRDC's) comments on the Department of Energy's (DOE's) *Surplus Plutonium Disposition Draft Environmental Impact Statement* (SPD DEIS) (DOE/EIS-0283-D), July 1998.

The SPD DEIS is deficient in the following respects:

I. The SPD DEIS fails to identify the current (and proposed future) locations, chemical and physical forms, isotopic mix, purity and related information concerning the various categories of plutonium that make up the 52.5 tonnes (t) of U.S. excess plutonium (Pu). Consequently, we are unable to judge whether the proposed disposition options are appropriate for each category of plutonium. 1

II. The United States and Russia completed a "Joint United States/Russian Plutonium Disposition Study" in September 1996. In this study Russia is on record as agreeing that, "The United States and Russia need not use the same [plutonium] disposition technology."[1] Thus, there is no compelling argument for allocating most of the U.S. excess plutonium to the mixed-oxide fuel (MOX) disposition alternative. The U.S. and Russian disposition options are not so inextricably linked to require the maximum possible amount of U.S. excess plutonium to be converted into MOX. NRDC believes that the United States should place a much higher priority on implementing the vitrification option in both countries. The SPD DEIS fails to discuss the process and criteria for deciding how much of the 33 t of Pu that is technically suitable for MOX will actually be fabricated into MOX, and it fails to discuss the timing of any decisions to vitrify any of this material. There is no discussion of the implications of this determination on the sizing of the 2

1. "Joint U.S./Russian Plutonium Disposition Study," September 1996, Executive Summary, p. Sum-2.

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FD314

FD314–1 **DOE Policy**

The locations of the surplus plutonium were provided in the *Storage and Disposition PEIS*, and the information in that document has been summarized in Section 1.1 and incorporated by reference into this SPD EIS. The current locations, with the exception of the pits that were moved from RFETS to Pantex, are the same as those given in the *Storage and Disposition PEIS.* The future locations of the surplus plutonium are specified in the *Storage and Disposition PEIS* ROD and will be documented in the ROD for this EIS. The detailed chemical and physical forms, isotopic mix, purity, and related information on surplus plutonium exist in classified reports that were used as source material in preparing the Storage and Disposition PEIS and this SPD EIS. An unclassified version of this information was prepared and made available to the public in a report titled *Feed Materials Planning Basis for Surplus Weapons-Usable Plutonium Disposition* (MD-0013, April 1997). The bounding isotopic composition of surplus plutonium is provided in Appendix J of this EIS.

In order to support the early closure of RFETS and the early deactivation of plutonium storage facilities at Hanford, DOE modified some of the decisions made in its *Storage and Disposition PEIS* ROD. In the amended ROD for the *Storage and Disposition PEIS*, DOE announced the following actions: (1) the accelerated shipment of all nonpit, surplus weapons–usable plutonium (about 7 t [7.7 tons]) from RFETS to SRS beginning in about 2000 if SRS is selected as the site for the immobilization facility, and (2) the relocation of all Hanford surplus weapons–usable plutonium (about 4.6 t [5.1 tons]) to SRS between about 2002 and 2005.

FD314–2 **Nonproliferation**

Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

DOE reviewed the chemical and isotopic composition of the surplus plutonium and determined in the *Storage and Disposition PEIS* ROD that about 8 t (9 tons) of surplus plutonium were not suitable for use in making MOX fuel. Furthermore, DOE has identified an additional 9 t (10 tons) for a total of 17 t (19 tons) that have such a variety of chemical and isotopic compositions that it is more reasonable to immobilize these materials and avert the processing complexity that would be added if these materials were made into MOX fuel. The criteria used in this identification included the level of impurities, processing requirements, and the ability to meet the MOX fuel specifications. If at any time it were determined that any of the 33 t (36 tons) currently proposed for MOX fuel fabrication was unsuitable, that portion would be sent to the immobilization facility. The addition of this material would not require the immobilization facility to operate longer because it is being designed to handle a throughput of up to 50 t (55 tons) over a 10-year period. Likewise, the MOX facility is being designed to handle up to 33 t (36 tons) of surplus plutonium, but would have the flexibility to operate at a lower throughput. Under either the immobilization-only approach or the hybrid approach, all 50 t (55 tons) of surplus plutonium would be processed out of the proposed plutonium disposition facilities over a 10– to 15–year period beginning in about 2006.

proposed MOX fabrication plant. In addition, the DEIS fails to provide the information needed respond to the following important questions: 2

1. Is the MOX option more or less expensive than the vitrification option? The SPD Final EIS should provide a comparative cost analysis of the vitrification and MOX methods that would clarify the relative costs of each to better inform future decisions on how much plutonium should be disposed of via each of these methods. 3

2. Does DOE agree that disposing of a given quantity of plutonium using the MOX disposition option is more likely to take longer than disposing of the same quantity of plutonium using the vitrification option? The SPD Final EIS should provide a comparison of the time required to dispose of a given quantity of plutonium by each option that would clarify the relative processing times of each to better inform future decisions on how much plutonium should be disposed of via each of these methods. 4

3. Does DOE agree that the MOX option is inherently more dangerous than the vitrification option? The SPD Final EIS should provide a comparison of nuclear material security and proliferation risks associated with each option that would clarify the relative magnitude of the dangers of each to better inform decisions on how much plutonium should be disposed of via each of these methods. 5

III. The current DOE policy makes construction of the U.S. MOX fabrication plant contingent on "significant progress with Russia on plans for plutonium disposition" by the end-FY 2000 [September 30, 2000].[2] There is no discussion in the SPD DEIS of this policy or its implications.

1. Exactly what is meant by "significant progress?"

2. What did the DOE have in mind when it adopted this policy? 6

3. Where in DOE's submissions to Congress is this policy set forth?

4. Will DOE move ahead with vitrification of the 17 t of Pu that is unsuitable for MOX even if there is no progress on the Russian side?

IV. In 1996, the U.S. and Russia agreed that "…disposition of U.S. and Russian excess weapons plutonium should proceed in parallel, with the goal of reductions to equal levels of military plutonium stockpiles."[3] However, the DEIS lacks the basic information needed to allow 7

2 Statement of Howard Cantor, Acting Director, Office of Fissile Material Disposition, at the Council on Foreign Relations "The Management and Disposition of Excess Nuclear Weapons Material," March 9, 1998.

3 "Joint U.S./Russian Plutonium Disposition Study," September 1996, Executive Summary, p. ExSum-2.

FD314–3 **Cost**

As shown in the cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons–Usable Plutonium Disposition* (DOE/MD-0009, July 1998), it is expected that the hybrid approach, which includes both immobilization and MOX fuel, would be more expensive than the immobilization–only approach. However, as discussed in response FD314–2, pursuing the hybrid approach provides the United States important insurance against potential disadvantages of implementing either approach by itself. For an update of the cost of the preferred alternative, see the new report, *Plutonium Disposition Life–Cycle Costs and Cost–Related Comment Resolution Document* (DOE/MD-0013, October 1999). These reports are available on the MD Web site at http://www.doe-md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS and Washington, D.C. DOE will continue to refine the cost estimates for the proposed surplus plutonium disposition facilities as decisions are made in the ROD and design of the facilities progresses.

FD314–4 **Alternatives**

Operation of the proposed surplus plutonium disposition facilities is expected to take approximately the same amount of time for either approach. The difference in timing for the hybrid approach is associated with the amount of time that MOX fuel would be irradiated in domestic, commercial reactors. However, none of the proposed reactors are expected to operate longer under the hybrid approach than they would if they continued to use LEU fuel.

FD314–5 **Nonproliferation**

DOE does not agree that the MOX approach is inherently more dangerous than the immobilization approach. DOE and NAS have conducted studies to compare risks, including the nuclear material security and proliferation risks of alternatives analyzed in this SPD EIS. These studies include the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Materials Storage and Excess Plutonium Disposition Alternatives* (DOE/NN-0007, January 1997), *Proliferation Vulnerability Red Team Report* (SAND 97-8203, October 1996), *Management and Disposition of Excess Weapons Plutonium* (March, 1994), and *Management and Disposition of*

Excess Weapons Plutonium, Reactor–Related Options (1995). As discussed in Section 4.28.2.5, studies by NAS have led it to the following conclusion: "no important overall adverse impact of MOX use on the accident probabilities of the LWRs involved will occur; if there are adequate reactivity and thermal margins in the fuel, as licensing review should ensure, the main remaining determinants of accident probabilities will involve factors not related to fuel composition and hence unaffected by the use of MOX rather than LEU fuel."

FD314–6 **Nonproliferation**

The term "significant progress" is not intended to be a singular formulaic benchmark. Rather, it is intended to be used in judging progress in the Russian program by a combination of political actions and commitments, practical steps, and concrete plans and timetables such that the U.S. and Russian programs can reasonably be said to be heading in the same general direction in the same overall timeframe. The United States would not construct new surplus plutonium disposition facilities until that expectation was satisfied. While joint U.S. and Russian efforts to disposition surplus plutonium are part of DOE's mission and while this SPD EIS notes the U.S. policies, the U.S. policies on this issue are beyond the scope of this SPD EIS. The Secretary of Energy has testified on numerous occasions regarding those policies. A recent testimony, to the House Committee on Science on May 20, 1999, can be found on the DOE Web site at http://www.doe.gov. Regardless of Russia's progress, DOE would begin immobilizing surplus plutonium in accordance with the decisions made in the SPD EIS ROD.

FD314–7 **Nonproliferation**

During the first week of September 1998, Presidents Clinton and Yeltsin held a Moscow summit and signed a statement of principles with the intention of removing approximately 50 t (55 tons) of plutonium from each country's stockpile. This document was added to Appendix A of this SPD EIS. The quantities and location of Russian plutonium, military or civil, are beyond the scope of this SPD EIS and are the subject of sensitive negotiations between the United States and Russia. It has never been a requirement or expectation of the United States that Russia's plans and programs for surplus plutonium

Congress, the public, and other government agencies to assess whether disposition is in fact "proceeding in parallel."

1. Exactly what is required on the Russian side in this regard?

2. What is the U.S. Government's best estimate of the total inventory of plutonium in Russia, exclusive of that still in spent civil power reactor spent fuel?

3. What is the U.S. Government's best estimate of Russia's weapon-grade plutonium inventory?

4. What are the U.S. Government's best estimates of Russia's separated fuel-grade and reactor grade inventories?

5. What are the U.S. Government's best estimates of Russia's "military and non-military plutonium stockpiles?

6. Where are these materials located in Russia to the best of the U.S. Government's knowledge?

7. Is the plutonium recovered from Russian naval reactor fuel that is currently stored at Mayak (along with Pu separated from VVER-440 spent fuel) considered to be part of Russia's military or civil plutonium stockpile?

8. Is the plutonium currently being recovered from plutonium production reactor fuel at Tomsk-7 and Krasnoyarsk-26 considered to be part of Russia's military or civil plutonium stockpile?

9. The terms "military plutonium" or "weapons plutonium" need to be more precisely defined; in particular, do these terms include plutonium derived from research or civil reactors and how do these terms relate to U.S. and Russian plutonium stockpiles as they are currently defined.

10. Please elaborate on the what is military and what is civil plutonium in the two countries.

11. For example, is plutonium in FFTF spent fuel military or civil?

7

V. On September 2, 1998, Presidents Clinton and Yeltsin signed an agreement that directs officials in both countries to draw up detailed plans and schedules for each country to dispose of 50 t of excess plutonium. The DEIS fails to provide information regarding the following questions:

1. Has Russia identified the sources of its 50 t of excess plutonium?

2. What fraction is weapon-grade?

3. What fraction is from pits removed from dismantled nuclear weapons, and what fraction, if any, is in other forms?

8

disposition would proceed in lock-step with the U.S. program. The intermediate steps of the two programs and their precise timing do not have to be the same, provided the Russians are drawing down their stocks of surplus plutonium along agreed paths and in general consonance with the timing of the U.S. program. What is required of Russia is a combination of political actions and commitments, practical steps, and concrete plans and timetables such that the two programs can reasonably be said to be heading in the same general direction in the same overall timeframe.

The terms "military plutonium" and "weapons plutonium" are not used in this EIS. Weapons-grade and weapons-usable material are defined in Chapter 6. All the plutonium that is the subject of this EIS is considered weapons usable. The vast majority of this material, with the exception of fuel for FFTF, was associated with military use.

FD314–8 **Nonproliferation**

The sources, composition, form, and quantities of Russian surplus plutonium are the subject of sensitive negotiations between the United States and Russia and are beyond the scope of this SPD EIS.

4. Assuming it is all from pits, which is NRDC's current understanding, if the U.S. and Russia each completed the disposition of their respective 50 t of excess plutonium in accordance with the above cited presidential agreement but disposed of no more plutonium, would the U.S. and Russia have achieved approximately equal levels of military plutonium stockpiles, and therefore be in accord with the 1996 agreement cited above? 8

5. If the answer to V.4. above is "no," how much additional plutonium would Russia and/or the U.S. have to dispose of to achieve approximately equal military plutonium stockpiles?

VI. The SPD DEIS fails to discuss any of the important physical security, material accounting and control, or international safeguards issues that concern the facilities used under the MOX and vitrification options. With regard to physical security, what are the design-basis external-assault threats and internal threats that will be used to judge the adequacy of the physical security at the proposed MOX fabrication facility? 9

VII. For safeguards purposes, the IAEA defines a "significant quantity" (SQ) of nuclear material as "the approximate quantity of nuclear material in respect of which, taking into account any conversion process involved, the possibility of manufacturing a nuclear explosive device cannot be excluded."[4] For direct-use material, the IAEA currently assumes an SQ of 8 kilograms (kg) of plutonium.

The SQ values were recommended to the IAEA by a group of experts, namely, the IAEA's Standing Advisory Group for Safeguards Implementation (SAGSI), and "relate to the potential acquisition of a first nuclear explosive by a non-nuclear weapon state."[5] The direct-use values—8 kg of plutonium, 8 kg of uranium-233, or 25 kg of HEU—are also referred to by the IAEA as "threshold amounts," defined as "the approximate quantity of special fissionable material required for a single nuclear device."[6] The IAEA cites as a source for these threshold amounts a 1967 United Nations document.[7] The IAEA states: 10

> "These threshold amounts include the material that will unavoidably be lost in manufacturing a nuclear explosive device. They should not be confused with the minimum critical mass needed for an explosive chain reaction, which is smaller.[34]
> ---

4 *IAEA Safeguards Glossary, 1987 Edition*, IAEA, IAEA/SG/TNF/1 (Rev. 1), 1987, p. 23.

5 Thomas Shea, "On the Application of IAEA Safeguards to Plutonium and Highly Enriched Uranium from Military Inventories," IAEA, (June 1992, with additions: December 1992).

6 *IAEA Safeguards Glossary*, p. 23.

7 *Effects of the Possible Use of Nuclear Weapons ...*, United Nations, A/6858, 6 October 1967.

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FD314–9 **DOE Policy**

DOE has studied these issues in the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Materials Storage and Excess Plutonium Disposition Alternatives* (DOE/NN-0007, January 1997). As described in Chapter 2 (Volume I) of this SPD EIS, all of the proposed surplus plutonium disposition facilities would be built to DOE's highest security standards and are being proposed at sites where there is already a security force in place. Additional guards and security personnel would be hired to work at each of the facilities as needed and are included in the estimated workforce requirements evaluated in this EIS. Once it is determined where the proposed facilities would be located, a specific security plan would be developed and implemented, which considers all of the threats that could affect the facility. With regard to the MOX facility, physical security would be in accordance with NRC standards and be part of the NRC licensing process. The international safeguards associated with these facilities are the subject of ongoing sensitive negotiations between the United States and Russia. However, space has been allocated in each of the proposed facilities to accommodate such inspections.

FD314–10 **Nonproliferation**

As discussed in Section 2.4, it is likely that the United States would voluntarily offer to have the proposed surplus plutonium disposition facilities placed under international safeguards. However, the process of implementing international safeguards is not as yet fully defined. If these proposed facilities come under IAEA oversight, it is expected that the "significant quantity" as defined by IAEA in safeguarding the proposed facilities would be the same as that used by IAEA for safeguarding plutonium in other nations. Any discussion on the amount of plutonium needed to build a 1-kiloton weapon is classified and is beyond the scope of this SPD EIS.

The remainder of this comment is addressed in response FD314–9.

> [34] Using highly sophisticated techniques available to NW States, the critical mass and the corresponding threshold amount can also be significantly reduced, but these are special cases that need not be considered here."

For decades the IAEA has set invalid technical thresholds for the minimum quantity of nuclear material needed for a nuclear weapon, even for a low-technology first nuclear explosive by a non-nuclear weapon state, including consideration of unavoidable losses.

First, the current 8 kg SQ value for plutonium is consistent with assuming a 24 percent loss in fabricating a solid 6.1 kg plutonium core similar to the Trinity device or the Nagasaki bomb—equivalent to losing the outer 0.4 cm of the 4.5 cm core during casting and machining. This degree of imprecision seems exceptionally high for the numerically controlled techniques now available in the commercial marketplace.

Second, if one took the same *Fat Man* design, first tested at the *Trinity* site in New Mexico and dropped on Nagasaki in 1945, and simply substituted a three kg plutonium core for the 6.1 kg core that was used in 1945, the yield of this device would be on the order of one kiloton, still a very respectable atomic bomb that could create catastrophic losses in dense urban areas. Thus, based on this evidence alone, the IAEA is in error to assert that "highly sophisticated techniques available to NW States" are needed to make nuclear weapons with "significantly reduced" quantities of materials.

Third, since the early 1950's, the nuclear-weapon states have been producing nuclear explosives with yields in the several kiloton range from as little as 2 kg of plutonium. The so-called "highly sophisticated techniques available to NW States" referenced by the IAEA were known to U.S. weapons designers in the late-1940s and early 1950s—and are now available to anyone with the patience and skills to search the open technical literature. Nuclear devices using very small quantities of plutonium and HEU—so-called "fractional crit" weapons—with yields on the order of one Kt were tested during the Ranger series in 1951.

Finally, a well advised safeguards program for a given country or group of countries would set the "significant quantity" levels at values less than the minimum amount needed for a weapon, to guard against the fact that materials can be diverted from more than one source. The practice of setting higher levels to account for manufacturing losses is likewise imprudent, particularly in view of the fact that a significant fraction of these "losses" are technically recoverable. In sum, *safeguards apply to all non-weapons countries, irrespective of their technological sophistication, and safeguards effectiveness should be assessed with this fact in mind.*

Many IAEA-member countries, including Israel, India and Pakistan and several that are not declared nuclear weapon states, such as Japan, Germany, South Korea, have highly developed nuclear infrastructures, and must be considered technologically sophisticated. Israel is presumed to have deployed boosted fission weapons, and possibly two stage thermonuclear weapons. India claims to have tested a two-stage thermonuclear device this year. This claim is certainly credible given that it has been 24 years since its first nuclear weapon test in 1974. Even for countries that

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are in general not sophisticated technologically, such as North Korea, the key technical information needed to establish a program for achieving substantial compression via implosion techniques is now accessible in the unclassified literature. The quantities defining safeguards significance, therefore, must be based on the assumption that the proliferator has access to "advanced" technology (*i.e.*, at least 1950's era). Whatever the nonproliferation "disinformation benefit" that may have flowed from the under-protective IAEA SQ values in the past, it is now far too late in the proliferation game to base the international nuclear control regime on flawed technical premises. As a consequence, the IAEA's SQ value should be lowered to no more than one eighth of the current value.

In 1994, NRDC released a report, "The Amount of Plutonium and Highly-Enriched Uranium Needed for Pure Fission Nuclear Weapons" (NRDC, Revised April 1995). In this report and in accompanying letter to the IAEA, NRDC requested that the IAEA revise its SQ value downward by a factor of eight. At about the same time the NRDC also requested that the United States Government, represented on the IAEA Board of Governors, take appropriate action to have IAEA make this revision.

DOE never responded to NRDC's request. It is our understanding that DOE had drafted a letter to NRDC endorsing lowering the IAEA SQ value by a factor of two—to four kg of plutonium—but that the State Department objected to it and that it was never sent.[8]

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1. Will the proposed MOX fabrication plant be subject to IAEA and/or bilateral safeguards?

2. What in DOE's view is the technically indicated SQ value that the IAEA should be using?

3. What in DOE's view is the technically indicated SQ value that DOE is, or should be, using?

4. What constitutes a "significant quantity" of plutonium for purposes of judging the adequacy of the material control and accounting measures at the MOX fabrication plant?

5. Is the SQ value for the MOX fabrication plant different from that used by the IAEA? If so, explain why.

6. Does DOE agree that a one-kiloton-yield fission weapon can be made with as little as one to three kilograms of weapon-grade plutonium?

[8] The letter was prepared for Mr. Ken Luongo, Director of the Office of Nonproliferation at DOE, and it was killed by Mr. Robert Einhorn at the State Department.

VIII. NRDC does not believe the proposed MOX fabrication plant can be operated with adequate material control and accounting procedures. In the parlance of nuclear material accounting, the inventory difference (ID) is defined as:

$$ID = BI + I - R - EI,$$

where BI is the beginning inventory, EI is the ending inventory, and I and R are, respectively, the material added and removed during the inventory period.[9] For the minimum amount of diverted plutonium (assumed by the IAEA to be the SQ value—currently 8 kg of plutonium) to be resolvable from measurement noise with detection and false alarm probabilities of 95% and 5%, respectively, it can be shown that 3.3 σ_{ID} must be less than the SQ value, where σ_{ID} is the uncertainty in the inventory difference.[10] For an SQ of 8 kg the σ_{ID} would have to be about 3 kg; and if the SQ value for plutonium were lowered to one kg, σ_{ID} should not exceed about 300 grams.

At Japan's Tokai Plutonium Fuel Production Facility (PFPF), where MOX fuel has been fabricated for Japan's Joyo and Monju fast-breeder reactors since 1988, the production line consisted of 17 interconnected glove boxes monitored by unattended, tamper-proof instruments, such as neutron coincidence counters. Following an April 1994 inspection conference with the IAEA, Japanese sources disclosed that on the order of 70 kg of plutonium was "held up" in the remotely monitored process line, and that the uncertainty in the hold-up material exceeded the 8 kg SQ value used by IAEA. 11

1. Identify the limit on σ_{ID} that DOE believes must be achieved in the MOX fabrication plant to provide technical detection with high confidence of the theft or diversion of a technically valid SQ of special nuclear material.

2. Explain how this limit will be achieved?

3. Please provide the historical ID data for other MOX and related facilities relevant to making an informed judgment as to whether technically adequate material control and accounting standards can be achieved at the proposed MOX plant.

4. What is the basis, if any, for believing that the proposed MOX plant would achieve inventory differences significantly less than those experienced at Japan's PFPF.

IX. To improve material control, large facilities that process or store nuclear weapon-usable materials are subdivided into numerous "material balance areas." The inventories and inventory differences within individual balance areas can be significantly smaller than those for the entire 12

[9] In the literature "inventory difference" (ID) is sometimes called "material unaccounted for" (MUF).

[10] Marvin Miller, "Are Safeguards at Bulk-Handling Facilities Effective?, Nuclear Control Institute, Washington, D.C., August 1990.

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FD314–11 **Nonproliferation**

NRC material control and accountability requirements would apply to the MOX facility, or potentially a combination of NRC and DOE requirements. If the decision is made in the SPD EIS ROD to go forward with the MOX facility, a limit on σ_{ID} would be established based on discussions with NRC and the approved NRC facility design. Any material control and accountability requirements would have to also satisfy international safeguards requirements agreed to between the United States and Russia. Existing IAEA standards, which would likely be similar to those implemented at the proposed MOX facility, are in place at MOX fuel fabrication facilities in Europe. These facilities have been able to meet the IAEA standards supporting DOE's belief that the proposed MOX facility would be able to meet similar standards. DOE is aware of the issues surrounding the problems referred to by the commentor in the Japanese facility and would work to avoid similar problems at the MOX facility.

FD314–12 **Nonproliferation**

The specific arrangements for applying international safeguards (including significant quality limits) at the MOX facility have not been fully determined. As discussed in response FD314–9, international safeguards are part of the sensitive negotiations between the United States and Russia. Final arrangements would be made during design and construction of the facility. Safeguards and security requirements, as well as material control and accountability requirements, would take into consideration internal and external threats involving the theft and diversion of nuclear materials and limits would be set accordingly.

facility. The SQ limits are often applied to the separate material balance areas. It must be recognized, however, that this approach does not afford adequate protection against state-sponsored diversions or a collusion of individuals removing materials from separate material balance areas. 12

1. In the SPD Final EIS indicate whether DOE agrees that the SQ limits should apply to the entire MOX facility? If not, explain why.

X. NRDC does not believe an adequate timely detection criterion can be met. Detection time (the maximum time that should elapse between diversion and detection of a significant quantity) should be in the same range as the conversion time, which is defined as the time required to convert different forms of nuclear material into components of nuclear weapons. For metallic plutonium, the conversion time is 7-10 days; for other forms of plutonium, it is 1-3 weeks. These conversion times are already much shorter than the period between inventories at any MOX plant operating today. Thus, there can be no assurance that the primary objective of safeguards—the timely detection of the theft, loss, or diversion of significant quantities of plutonium—will be met at the proposed MOX fabrication plant. 13

1. What timely warning criterion will be used for judging the adequacy of safeguards at the proposed MOX fabrication plant?

2. What is the basis for DOE's belief that the timely detection criterion can be met?

This concludes NRDC's comments on the SPD DEIS.

Sincerely,

Thomas B. Cochran
Director, Nuclear Program

FD314–13 **Nonproliferation**

Specific domestic and international safeguards would be developed during design and construction of the MOX facility. Because the surplus plutonium is weapons usable, the safeguards would include physical inventories as well as several active and passive measures. A single, integrated system of material control measures and accountability measurements would be used to monitor storage, processing, and transfer of nuclear material in the MOX facility. The facility accountability program would include an accounting system, a measurement and measurement control program, physical inventory programs, a material transfer program, and a program to assess material control indicators.

The accounting system would be a near real–time system that would require the prompt reporting of any change in the accountable quantity, location, user, or form of the nuclear material. This system would include measurement subsystems, and both destructive and nondestructive assay to ensure that quantities of nuclear materials were stated with the timeliness, accuracy, and precision required in DOE/NRC regulations and any international agreements. These material control and accountability measures would ensure that potential theft, loss, or diversion of material would be detected well before that material could be converted into a nuclear weapon.

NUCLEAR CONTROL INSTITUTE
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September 16, 1998

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Comments of the Nuclear Control Institute
on the Surplus Plutonium Disposition
Draft Environmental Impact Statement

The Nuclear Control Institute ("NCI") submits the following comments on the Department of Energy's Surplus Plutonium Disposition Draft Environmental Impact Statement (DOE/EIS-0283-D, July 1998) ("draft EIS"). Bracketed page numbers in these comments refer to this document.

1. The Department of Energy should utilize exclusively the immobilization approach to surplus plutonium disposition in the United States. The MOX approach under the "dual track" disposition policy is not justified even if there is a need to proceed in parallel with Russia.

DOE's January 1997 Record of Decision on Plutonium Disposition outlined a "dual track" approach utilizing both immobilization and MOX. The Department has defended this approach as a prerequisite to working in parallel with Russian counterparts who view plutonium as "national treasure" and are unwilling to dispose of it as waste. NCI remains unconvinced by this argument, for reasons explained in detail elsewhere.[1] 1

However, DOE's rationale for the "dual track" was recently superseded by the plutonium disposition agreement signed by Presidents Clinton and Yeltsin at their Moscow summit meeting. This agreement marked Russia's first formal acknowledgement of the acceptability of the immobilization approach. The agreement specifies that "[t]he two governments will cooperate to pursue this goal [of each nation disposing of 50 metric tons of surplus weapons plutonium] through consumption of plutonium fuel in existing nuclear reactors (or reactors which may enter

[1] Edwin S. Lyman and Paul Leventhal, "Bury the Stuff," Bulletin of the Atomic Scientists, March/April 1997, pp. 45-48.

Strategies for stopping the spread and reversing the growth of nuclear arms.

Paul L. Leventhal, *President*, Peter A. Bradford, David Cohen, Denis A. Hayes, Julian Koenig, Sharon Tanzer, Roger Richter, Dr. Theodore B. Taylor
BOARD OF DIRECTORS

FD327

FD327–1 **Nonproliferation**

DOE acknowledges the commentor's opposition to the use of plutonium in MOX fuel. Russian cooperation is not the only reason DOE has identified as its preferred alternative the hybrid approach for the disposition of U.S. surplus plutonium. The environmental impacts associated with the immobilization-only alternatives—as well as the hybrid (MOX and immobilization) and the no action alternatives—are discussed in this SPD EIS. Costs are discussed in two reports prepared by DOE, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), which analyzes the site-specific cost estimates for each alternative, and *Plutonium Disposition Life-Cycle Costs and Cost-Related Comment Resolution Document* (DOE/MD-0013, November 1999), which covers recent life-cycle cost analyses associated with the preferred alternative. These reports are available on the MD Web site at http://www.doe-md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

DOE believes the hybrid approach provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again. Pursuing both the immobilization and MOX approaches also provides important insurance against potential disadvantages of implementing either approach by itself. DOE reserves the option to immobilize all the surplus plutonium as discussed in Alternatives 11 and 12 and has evaluated the environmental impacts of these alternatives (including considering the number of facilities, the number of processing stages, and the transportation requirements).

In regard to the MOX facility, DOE intends to design, construct, and operate it in such a fashion as to provide a level of safety that meets or exceeds applicable Federal, State, and local requirements. The MOX facility would be built and operated subject to the following strict conditions: construction would take place at a secure DOE site, it would be owned by the U.S. Government, operations would be limited exclusively to the disposition

NUCLEAR CONTROL INSTITUTE
STEVEN DOLLEY

into service during the duration of our cooperation) or the immobilization of plutonium in glass or ceramic form mixed with high-level radioactive waste."[2] [emphasis added]

In light of this agreement, and DOE's acknowledgement in both the ROD and draft EIS that it is technically feasible to immobilize all 50 tons of surplus U.S. weapons plutonium, there is no imperative to pursue a MOX approach in the United States at all. DOE's own studies demonstrate that immobilization would be cheaper, faster and safer than the MOX approach,[3] and is therefore the more desirable method now that it is clear MOX need not be pursued in the United States to satisfy Russian concerns. 1

In the most straightforward sense, immobilization has clear-cut environmental and safety advantages. Fewer processing stages, fewer facilities, and less transportation are involved with immobilization than with MOX. The immobilization-only approach also offers great flexibility for the U.S. disposition program. If desired, the United States could promptly and unilaterally immobilize all 50 tons of its surplus plutonium, as a demonstration and incentive to Russian disposition. If parallelism and Russian reciprocity were deemed important but did not materialize, a U.S. immobilization-only approach could be put on hold with far less disruption than a MOX/reactor approach.

2. The draft EIS comparison of MOX and immobilization is unfairly skewed in favor of MOX.

The draft EIS assesses site-specific environmental impacts of the immobilization process all the way through to production of the final waste form. The MOX approach, on the other hand, is only analyzed on a generic basis after the point at which fresh MOX fuel is fabricated. Analysis of environmental and safety questions related to use of specific reactors and storage of spent MOX fuel is relegated to a separate "environmental critique" which will not be available until the final EIS is released. This provides an unbalanced comparison of the MOX and immobilization options. NCI is preparing an in-depth technical analysis of safety issues related to the use of weapons-plutonium MOX fuel in light-water reactors, and this analysis would be greatly enhanced by the availability of reactor-specific data. Environmental impacts of MOX fuel use could vary widely from site to site (i.e., the North Anna plant vs. WNP-2). Therefore, issuance of the final EIS should be deferred until the public has a reasonable opportunity to 2

[2] Joint Statement of Principles for Management and Disposition of Plutonium Designated as No Longer Required for Defense Purposes," September 2, 1998.

[3] For example, ceramic can-in-canister immobilization could begin two years sooner than a MOX-immobilization "hybrid option," and be completed six years sooner. U.S. DOE, Office of Fissile Materials Disposition, Technical Summary Report for Surplus Weapons-Usable Plutonium Disposition, Rev. 1, October 31, 1996, Table ES-2, p. ES-11. DOE estimates that an immobilization-only alternative would cost from $1.7 to $1.9 billion, whereas the hybrid alternatives would cost from $1.8 billion to $2.1 billion (with fuel offset) or from $2.7 to $2.9 billion (without fuel offset). U.S. Department of Energy, Office of Fissile Materials Disposition, Cost Analysis and Support of Site Selection for Surplus Weapons Usable Plutonium Disposition, DOE/MD20009, July 22, 1998, Table 3-2, p. 3-17; Table 3-3, p. 3-18.

2

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of surplus plutonium, and the MOX facility would be shut down at the completion of the surplus plutonium disposition program.

The *Joint Statement of Principles* signed by Presidents Clinton and Yeltsin in September 1998 provides general guidance for achieving the objectives of a future bilateral agreement to disposition surplus plutonium in the United States and Russia. Sensitive negotiations between the two countries have indicated that the Russian government accepts the technology of immobilization for low-concentration, plutonium-bearing materials, but that the MOX approach would be considered for higher-purity feed materials.

FD327–2 **MOX RFP**

The SPD Final EIS was not issued until the proposed reactors had been identified and the public had an opportunity to comment on the reactor-specific information. As part of the procurement process, bidders were asked to provide environmental information to support their proposals. This information was analyzed in an Environmental Critique prepared for the DOE source selection board prior to award of the MOX fuel fabrication and irradiation services contract. DOE then prepared an Environmental Synopsis on the basis of the Environmental Critique, which was released to the public as Appendix P of the *Supplement to the SPD Draft EIS* in April 1999. This *Supplement* included a description of the affected environment around the three proposed reactor sites, and analyses of the potential environmental impacts of operating these reactors using MOX fuel (Sections 3.7 and 4.28 of this SPD EIS, respectively). During the 45-day period for public comment on the *Supplement*, DOE held a public hearing in Washington, D.C., on June 15, 1999, and invited comments. Responses to those comments are provided in Volume III, Chapter 4.

review and comment upon the reactor-specific environmental critique. 2

3. Issues related to plutonium oxide "hold up" in the MOX fuel fabrication facility should be addressed.

In modern MOX fuel fabrication facilities, almost all operations are carried out by remote handling in glove boxes. Significant portions of the plutonium oxide throughput of these plants can become "held up" in these glove boxes. Since opening in 1988, the small, pilot PFPF MOX plant in Japan accumulated a hold-up of over 70 kilograms of plutonium, and the plant operator was eventually required by the International Atomic Energy Agency to clean out and account for this material, at a cost of over $100 million. 3

NCI has expressed concern about the hold-up issue in a non-proliferation and safeguards context.[4] From a NEPA perspective, it should be noted that plutonium hold-up constitutes a safety and health risk, not only to MOX plant workers but to the general public by increasing the plant's source term in case of an accident. If required later because of excessive hold-up, a full facility clean-out would also pose significant risks of worker exposure to plutonium. The draft EIS does not address the hold-up issue. It is important that the final EIS do so.

4. The "plutonium polishing" option should not be pursued.

DOE has offered respondents to its request for proposals for MOX disposition work the opportunity to propose aqueous processing, so-called "plutonium polishing," to remove gallium and other impurities from plutonium prior to its fabrication into MOX fuel. The detrimental effects of gallium on fuel cladding and reactor safety have not been fully documented and could prove significant. "Plutonium polishing" would significantly increase the environmental impact of the MOX option by creating large amounts of TRU and low-level waste, an increase of 10 to 20 percent over non-polishing options.[5] It would also contravene U.S. non-proliferation policy, in that it would be likely to provide strong support of Russia's plans for aqueous treatment of its own surplus weapons plutonium. Because trace amounts of gallium do not affect the immobilization process or final waste form, the plutonium polishing step could be avoided entirely if the U.S. were to pursue an immobilization-only approach. 4

5. Lengthy storage of fresh MOX fuel at reactor sites poses security risks and should be avoided.

The draft EIS foresees a 10-year operational life for the MOX fabrication plant, but considerable additional time, possibly years, would be required to cycle all this MOX fuel through reactors. NCI objects to long-term storage of fresh MOX fuel at reactor sites on security grounds. Such fresh MOX fuel lacks a radiation barrier, and if stolen, weapons-grade plutonium 5

[4] Steven Dolley, Nuclear Control Institute Comments on the Draft PEIS for Plutonium Disposition, June 7, 1996.

[5] "Appendix N: Plutonium Polishing," draft EIS, pp. N-8 - N-9.

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FD327–3 **Nonproliferation**

DOE is aware of a Japanese plutonium processing incident in which the holdup of a significant amount of MOX powder in the processing lines made it difficult to measure the exact quantity of materials from outside the sealed gloveboxes. The design and operation of the MOX facility would incorporate lessons learned (regarding procedures and equipment) to ensure a low net plutonium loss and would be compatible with NRC and international safeguards. Physical inventories, measurements, and inspections of material both in process and in storage would be used to verify records and ensure that there was no significant holdup of plutonium in the gloveboxes.

FD327–4 **Plutonium Polishing and Aqueous Processing**

DOE acknowledges the commentor's opposition to the MOX approach and plutonium polishing. On the basis of public comments received on the SPD Draft EIS, and the analysis performed as part of the MOX procurement, DOE has included plutonium polishing as a component of the MOX facility to ensure adequate impurity removal from the plutonium dioxide. While it is true that plutonium polishing would add to the amount of LLW and TRU waste generated, this amount should be a small fraction of the total amount of these waste types generated at the candidate sites. For example, at SRS, which is the preferred site for the MOX facility, the addition of the plutonium-polishing process would be expected to increase the site's projected generation of LLW and TRU waste by less than 1 percent and 2 percent, respectively. Section 4.32.4 discusses the cumulative impacts of the proposed action at SRS; Sections 4.32.1, 4.32.2, and 4.32.3, the cumulative impacts of the proposed action at Hanford, INEEL, and Pantex, respectively.

FD327–5 **MOX Approach**

DOE acknowledges the commentor's concern about the storage of fresh MOX fuel at reactor sites. The proposed action does not involve lengthy storage of fresh fuel at reactor sites. Moreover, as discussed in Section 2.4.3.2, the MOX fuel would be managed in essentially the same way as fresh LEU fuel (with tighter security because of the plutonium), which is usually received at the reactor site shortly before it would be inserted into the reactor. The MOX facility includes space for storage of up to 2 years' worth of fresh fuel

could be separated from this MOX by straightforward chemical means. EDF, the French nuclear utility, does not permit fresh MOX fuel to be stored at its reactor sites for more than two weeks, and does not allow any dry storage of such fresh fuel.[6] The same strict security requirement should be imposed on MOX fuel storage, and the additional costs of meeting this storage standard, and of additional security at reactor sites, should be included in the EIS. 5

6. The "216 process" is an inappropriate approach to safety analysis of MOX candidate reactors.

DOE proposes to analyze environmental impacts of specific commercial reactors offered by consortia for MOX fuel irradiation by means of the process specified in 10 CFR 1021.216 (the "216 process"). This regulatory language is part of DOE's NEPA Implementing Regulations, and provides for an "environmental critique," to be prepared by DOE, which "may contain proprietary information which will, therefore, not be made available to the public." [p. S-12] A synopsis will be published in the final EIS, but the full environmental critique would never be made public.

The proposed implementation of the 216 process is entirely unacceptable. First, DOE has indicated that consortia bidders will have complete discretion to determine which information they submit to DOE should be considered "proprietary" and withheld from the public. Thus, any information bearing on the safety of reactors fueled with MOX that the industry does not want subjected to public scrutiny could be withheld. Second, the public synopsis would not be made available until the *final* EIS is released, i.e., after the public input process under NEPA is completed. Public comments on the final EIS are unlikely to have any significant impact on DOE's record of decision. 6

An example of the abuse that can arise from excessive discretion to withhold release of "proprietary" data in regulatory proceedings is the recent revelation in Great Britain that "a supposedly independent report by the accountancy firm Touche Ross - used to provide the economic justification for the Thorp reprocessing plant - had never been drawn up....Environmentalists, independent scientists and the Labour Party in opposition all called for the report to be published, but BNFL which runs Sellafield, refused to do so on the grounds that it was commercially confidential. Recently the Environment Minister, Michael Meacher, asked to see the report but was told, to his amazement, that it did not exist."[7]

DOE has discretion to apply the standards of law in order to determine whether data that the consortia want to be withheld in fact meets these standards. DOE should review this material, with a presumption in favor of public release. The provisions of DOE NEPA regulations which require withholding of "commercially confidential" information should be narrowly interpreted

[6] D. L. Williams Jr., "Licensing Issues Associated with the Use of Mixed-Oxide Fuel in U.S. Commercial Nuclear Reactors," Oak Ridge National Laboratory Report, ORNL/TM-13421, April 1997, p. 9.

[7] Geoffrey Lean, "Report that Justified Thorp Nuclear Plant Never Existed," Independent on Sunday, September 13, 1998.

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assemblies, which was included in the cost estimates for the MOX facility. Any actual restrictions or requirements related to the storage of fresh MOX fuel at the proposed reactor sites would be imposed by NRC as part of the operating license amendment process.

FD327–6 **MOX RFP**

DOE has withheld no information regarding reactor-specific safety analyses conducted for this SPD EIS. Those analyses are discussed in Section 4.28.2.5.

The remainder of this comment is addressed in response FD327–2.

and applied, in order to assure that the maximum amount of data is made available to the public consistent with the requirements of law. The Department should err on the side of disclosing, rather than withholding, and this policy governing the 216 process should be stated clearly in the final EIS. 6

7. Issues related to burnup levels of irradiated MOX fuel should be addressed.

The draft EIS merely refers to the 1996 PEIS's generic safety analysis of MOX fuel irradiation in LWRs. It does not incorporate new information on safety issues related to the burnup level of MOX fuel. In light of recent findings that "MOX fuel shows a higher failure potential than UO_2 at comparable burn up," as revealed by a recent MOX fuel experiment at the Cabri test reactor in France,[8] significant consideration should be given to limiting average burnup of MOX fuel to the regulatory ceiling of 36,000 MW-D/MTHM now imposed in France.[9] This is the only way to avoid with assurance the risks associated with the propensity of high-burnup MOX fuel to catastrophically rupture in the event of reactivity transients or loss-of-coolant accidents (LOCAs). 7

This problem may be more severe for weapons-grade MOX because the phenomenon believed to be responsible for the inferior behavior of MOX fuel (locally high burnups and fission gas release because of the inhomogenous distribution of plutonium in MOX fuel) would be exacerbated by the higher fission rates that occur in weapons-grade plutonium.

8. Additional NEPA analyses might be required.

A number of significant federal actions are mentioned in the draft EIS as potential options that might be pursued in the disposition program. These actions include the "plutonium polishing" option, irradiation of U.S. and Russian MOX in CANDU reactors in Canada, and fueling the Fast Flux Test Reactor (FFTF) with weapons-plutonium MOX to produce tritium for the U.S. nuclear arsenal. We note and concur with DOE's position in the draft EIS that, in each case, additional NEPA analysis beyond the SPD EIS would be required if any of these actions were to be pursued. 8

Sincerely,

Steven Dolley
Research Director

[8] F. Schmitz, Institute de Protection et de Surete Nucleaire (IPSN), "The Status of the Cabri REP-Na Test Programme: Present Understanding and Still Pending Questions," presentation to the NRC/Industry Meeting on High-Burnup Fuel Issues, Rockville, Maryland, November 18-20, 1997.

[9] Jean-Luc Provost, Electricite de France, "Plutonium Recycling and Use of MOX Fuel in PWR: EDF Operating Experience," Industry Presentation to NRC on the Use of MOX Fuel, Rockville, Maryland, February 21, 1997.

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FD327–7 **MOX Approach**

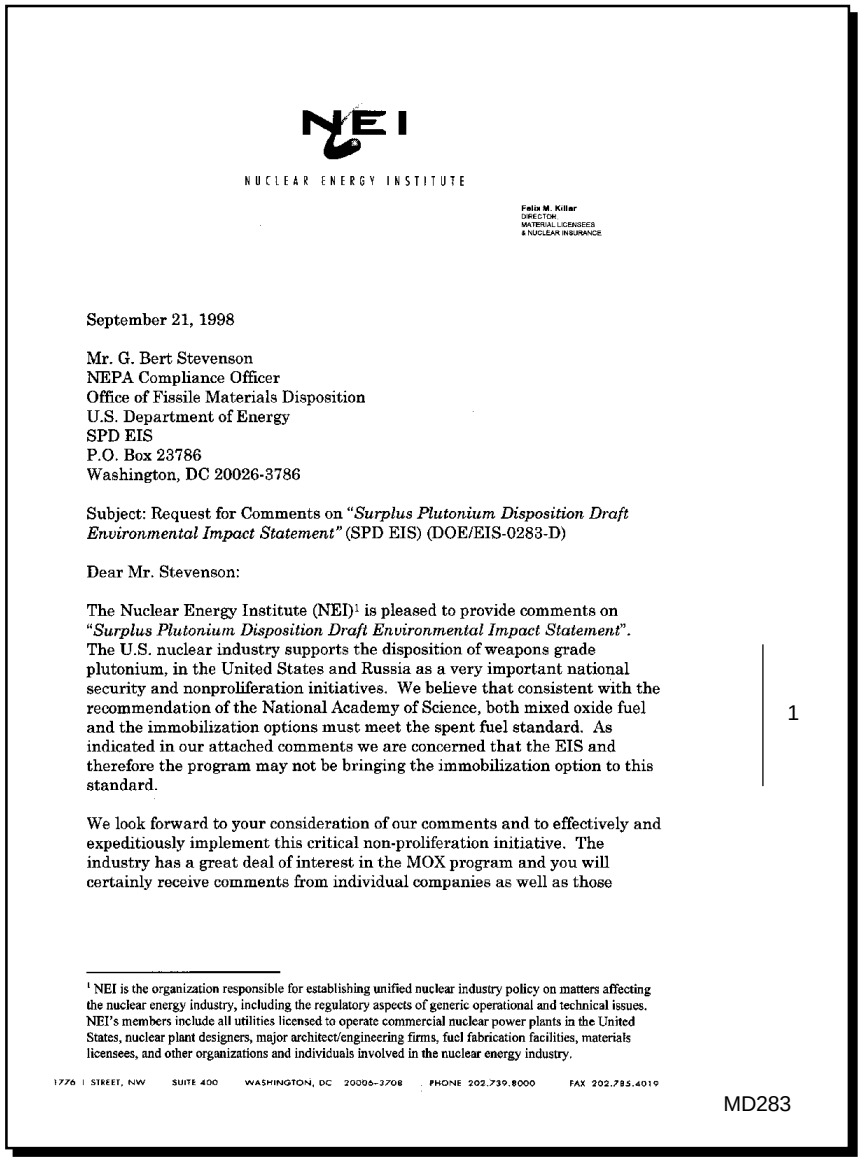
Section 4.28 was revised to provide reactor-specific analyses and discuss the potential environmental impacts of using a partial MOX core during routine operations and reactor accidents. The referenced failure of the Cabri fuel in the French experiment was not related to the fact that the failure involved MOX fuel. Even if the test failure were actually related to MOX fuel, the significance would be questionable, for tests were conducted on a contrived set of conditions to explore regions of performance well outside the operating regime for commercial reactors. The tests were designed to test enthalpies of high burnup fuels, both LEU and MOX, under severe transient conditions. Although other factors would also invalidate the application of the Cabri test data to the U.S. MOX fuel case, the most important characteristic of the test fuel—high burnup—would not apply because the MOX fuel is planned for irradiation for only two cycles, resulting in a maximum burnup of only 45,000 MW-day/MTHM. The acceptability of burnups at this level has been aptly demonstrated in Belgian, French, and German reactors.

FD327–8 **General SPD EIS and NEPA Process**

DOE acknowledges the commentor's views that additional NEPA analysis beyond this SPD EIS would be required for the use of CANDU reactors and the restart of FFTF. In the SPD Draft EIS, DOE retained the option to use some of the surplus plutonium as MOX fuel in CANDU reactors, which would have only been undertaken in the event that a multilateral agreement were negotiated among Russia, Canada, and the United States. Since the Draft was issued, DOE determined that adequate reactor capacity is available in the United States to disposition the portion of the U.S. surplus plutonium that is suitable for MOX fuel and, therefore, while still reserving the CANDU option, DOE is no longer actively pursuing it. However, DOE, in cooperation with Canada and Russia, proposes to participate in a test and demonstration program using U.S. and Russian MOX fuel in a Canadian test reactor. A separate environmental review, the *Environmental Assessment for the Parallex Project Fuel Manufacture and Shipment* (DOE/EA-1216, January 1999), analyzes the fabrication and proposed shipment of MOX fuel rods for research and development activities involving the use of limited amounts of U.S. MOX fuel in a Canadian test reactor. A FONSI was signed on August 13, 1999.

Both of these documents can be viewed on the MD Web site at http://www.doe-md.com. If a decision is made to dispose of Russian surplus plutonium in Canadian CANDU reactors in order to augment Russian's disposition capability, shipments of the Russian MOX fuel would take place directly between Russia and Canada.

As discussed in Section 1.7.4, Appendix D was deleted because none of the proposals to restart FFTF currently consider the use of surplus plutonium as a fuel source. DOE has included plutonium polishing as a component of the MOX facility. Section 2.18.3 and the hybrid alternatives analyses in Chapter 4 of Volume I were revised to include the impacts associated with plutonium polishing.



NUCLEAR ENERGY INSTITUTE

Felix M. Killar
DIRECTOR
MATERIAL LICENSEES
& NUCLEAR INSURANCE

September 21, 1998

Mr. G. Bert Stevenson
NEPA Compliance Officer
Office of Fissile Materials Disposition
U.S. Department of Energy
SPD EIS
P.O. Box 23786
Washington, DC 20026-3786

Subject: Request for Comments on "*Surplus Plutonium Disposition Draft Environmental Impact Statement*" (SPD EIS) (DOE/EIS-0283-D)

Dear Mr. Stevenson:

The Nuclear Energy Institute (NEI)[1] is pleased to provide comments on "*Surplus Plutonium Disposition Draft Environmental Impact Statement*". The U.S. nuclear industry supports the disposition of weapons grade plutonium, in the United States and Russia as a very important national security and nonproliferation initiatives. We believe that consistent with the recommendation of the National Academy of Science, both mixed oxide fuel and the immobilization options must meet the spent fuel standard. As indicated in our attached comments we are concerned that the EIS and therefore the program may not be bringing the immobilization option to this standard.

1

We look forward to your consideration of our comments and to effectively and expeditiously implement this critical non-proliferation initiative. The industry has a great deal of interest in the MOX program and you will certainly receive comments from individual companies as well as those

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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MD283–1 **DOE Policy**

DOE acknowledges the commentor's concern regarding the ability of the immobilization approach to meet the Spent Fuel Standard. In the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives* (DOE/NN-0007, January 1997), DOE identified two potential liabilities of the immobilization alternatives relative to the Spent Fuel Standard. These liabilities involve ensuring sufficient radiation levels and providing removal-resistant can-in-canister designs. Since that time, DOE has modified the can support structure inside the canisters and has focused its research on the ceramic form of immobilization. As part of the form evaluation process, an independent panel of experts determined (*Letter Report of the Immobilization Technology Peer Review Panel*, from Matthew Bunn to Stephen Cochran, LLNL, August 21, 1997) that the can-in-canister design would meet the Spent Fuel Standard. In terms of plutonium 240 content, it is not necessarily required that isotopic dilution be used to make the material as inaccessible and unattractive for weapons use as the plutonium that exists in highly radioactive spent nuclear fuel from commercial reactors. In addition, NAS is currently conducting studies to confirm the ability of the ceramic can-in-canister immobilization approach to meet the Spent Fuel Standard. DOE is confident that immobilization remains a viable alternative for meeting the nonproliferation goals of the surplus plutonium disposition program.

Mr. G. Bert Stevenson
U.S. Department of Energy
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submitted herein. If you have any questions concerning the information contained in this letter, please do not hesitate to contact me.

Sincerely,

Felix M. Killar

Attachment

MD283

Comments on the Department of Energy's (DOE's)
Surplus Plutonium Disposition Draft Environmental Impact Statement

Location	Comment	
Executive Summary p. S-8	Specification of "can-in-canister" immobilization as a preferred alternative. DOE is proposing "can-in-canister" immobilization as its preferred alternative for immobilization. However, the DOE's own reports[2,3] indicate that "can-in-canister" immobilization does not currently meet the Spent Fuel Standard for long-term nonproliferation resistance. The United States must deploy an effective, accepted plutonium disposition technology or technologies if it wants to encourage international support for plutonium disposition. NEI expects that concurrent action on the part of Russia to dispose of its surplus plutonium will be predicated on the disposition of United States material in a manner that provides high confidence in its resistance to theft, diversion, or re-use. *Recommendations:* DOE should consider only those alternatives that meet the Spent Fuel Standard [i.e., mixed oxide (MOX) fuel and homogeneous immobilization] as preferred alternatives. If the DOE pursues deployment of "can-in-canister" immobilization, the DOE should explain how it will demonstrate, in an open, objective, and peer-reviewed process, that the "can-in-canister" plutonium disposition approach will meet this fundamental program requirement - the Spent Fuel Standard. DOE should also explain why immobilized/"can-in-canister" does not have to meet the denatured aspect of the spent fuel standard i.e. the Plutonium 240 content will not be greater than 20%.	1
Location	Comment	
Executive Summary p. S-14.	Quantities of plutonium considered in the EIS for disposal using the two approaches. The draft EIS states, "Since the ROD was issued, however, DOE has determined that an additional 9 tonnes of low plutonium content materials would require additional processing and would, therefore, be unsuitable for MOX fuel fabrication." DOE alternatives include disposing of a maximum of 33 tonnes of plutonium as MOX fuel, while the alternatives include immobilizing 50 tonnes of surplus plutonium. DOE has never provided justification that any surplus plutonium is not suitable for MOX use. The DOE has not explained what form this "unsuitable" plutonium is in. The technology descriptions in the draft EIS make it clear that various kinds of processing will be used in the Conversion and Immobilization Facility. It would appear to be possible that some of this processing would render material that is suitable for fabrication into MOX fuel. Finally, the DOE has specified no requirements that the plutonium destined for either MOX fuel or immobilization must satisfy. Therefore, it seems very unlikely that there is any technical basis for any decision about quantities of plutonium that are suitable or unsuitable for either option.	2

[2] Sandia National Laboratories, SAND97-8203 - Proliferation Vulnerability Red Team Report, October 1996.

[3] U. S. Department of Energy, DOE/NN-0007 - Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives, January 1997.

MD283

MD283–2 **Feedstock**

DOE reviewed the chemical and isotopic composition of the surplus plutonium and determined in the *Storage and Disposition PEIS* ROD that about 8 t (9 tons) of surplus plutonium were not suitable for use in making MOX fuel. Furthermore, DOE has identified an additional 9 t (10 tons) for a total of 17 t (19 tons) that have such a variety of chemical and isotopic compositions that it is more reasonable to immobilize these materials and avert the processing complexity that would be added if these materials were made into MOX fuel. The criteria used in this identification included the level of impurities, processing requirements, and the ability to meet the MOX fuel specifications. Section 2.2 includes a description of the forms of plutonium that would be used for MOX feed and immobilization feed. None of the material planned for immobilization is in the form of spent fuel, and all of it is considered weapons usable. A further description of the types and amounts of plutonium currently planned for disposition can be found in *Feed Materials Planning Basis for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0013, April 1997).

NUCLEAR ENERGY INSTITUTE
FELIX M. KILLAR
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Recommendation:
Given the lack of justification for any decision about quantities of material for the two options, DOE should include the evaluation of a 100% (50 tonne) MOX fuel alternative in the SPD EIS. This is the only way to preserve all appropriate options until the time that the DOE can make a technically defensible evaluation and decision on the allocation of material to the two plutonium disposition approaches. We have recently learn that the Russians do not believe the material that is planned for immobilization is truly weapons grade plutonium. If it is already in the form of spent fuel or contains contaminants such that it can't be used for weapons then it should not be considered as part of this program and additional pits should be identified. 2

Location	Comment	
Appendix D, p. D-2	The appendix states "If it were determined that MOX fuel (rather than uranium-only fuel) were needed for the FFTF operations, the MOX fuel fabrication alternatives may be eliminated, depending on the amount of surplus plutonium that would be required for tritium production." However, it is our understanding that the capability to fabricate significant quantities of MOX fuel for the FFTF does not currently exist within the DOE complex.	3

Recommendation:
DOE should acknowledge that use of the FFTF with plutonium fuel in this manner would require the design and construction of a MOX fuel fabrication facility for the FFTF fuel or consider off shore production of MOX fuel. It is the light water reactor irradiation of MOX fuel that might be eliminated by such a course of action.

Location	Comment	
Sections 2.17 and 2.18.	Hot cell examinations of irradiated lead assembly fuel. The environmental impacts in the draft EIS do not appear to include those impacts associated with hot cell examinations. In particular, there is no acknowledgment that the hot cell facilities would be responsible for the disposal of the spent nuclear fuel that results from destructive hot cell examinations.	4

Recommendation:
DOE should revise the EIS to include these impacts, or note that such impacts are already included in other environmental evaluations.

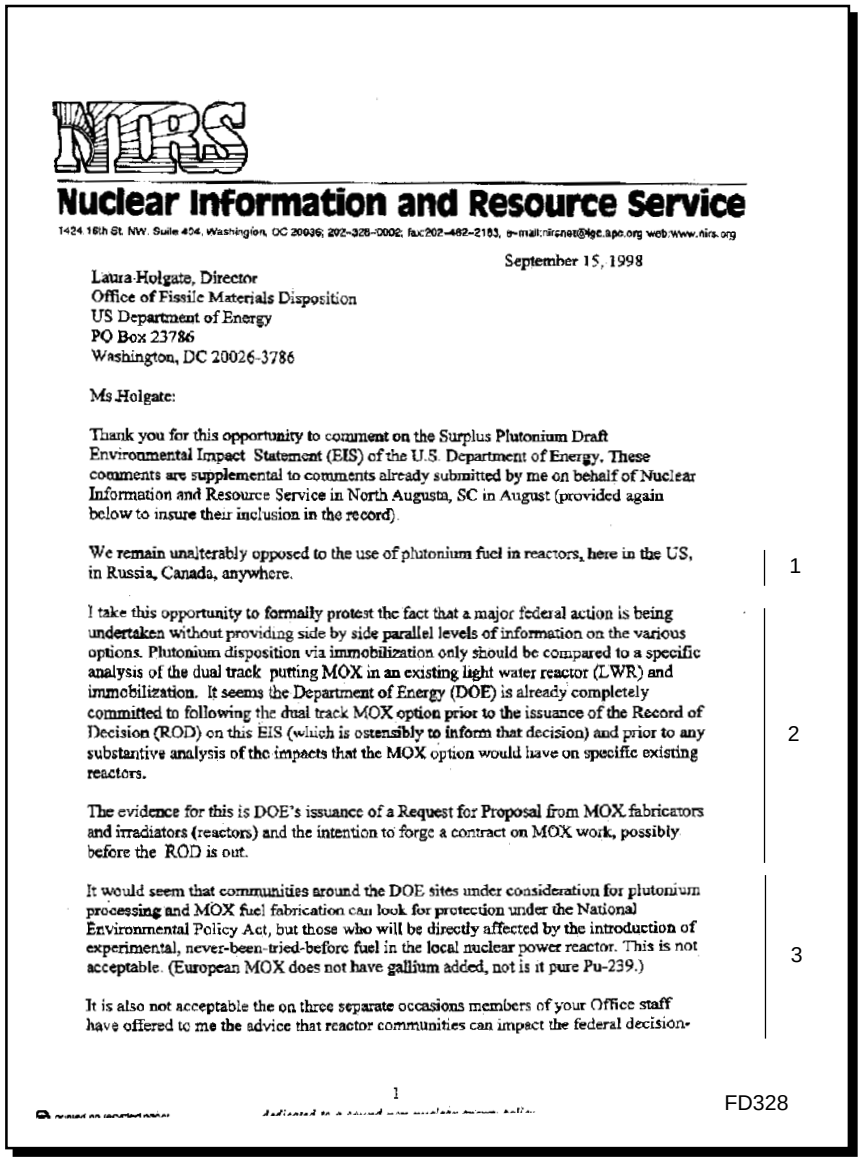
MD283

MD283–3 **DOE Policy**

As discussed in Section 1.7.4, Appendix D was deleted because none of the proposals to restart FFTF currently consider the use of surplus plutonium as a fuel source.

MD283–4 **Lead Assemblies**

Section 2.18 was revised to include a description of the impacts of postirradiation examination of lead assemblies.



Nuclear Information and Resource Service

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September 15, 1998

Laura Holgate, Director
Office of Fissile Materials Disposition
US Department of Energy
PO Box 23786
Washington, DC 20026-3786

Ms Holgate:

Thank you for this opportunity to comment on the Surplus Plutonium Draft Environmental Impact Statement (EIS) of the U.S. Department of Energy. These comments are supplemental to comments already submitted by me on behalf of Nuclear Information and Resource Service in North Augusta, SC in August (provided again below to insure their inclusion in the record).

We remain unalterably opposed to the use of plutonium fuel in reactors, here in the US, in Russia, Canada, anywhere. 1

I take this opportunity to formally protest the fact that a major federal action is being undertaken without providing side by side parallel levels of information on the various options. Plutonium disposition via immobilization only should be compared to a specific analysis of the dual track putting MOX in an existing light water reactor (LWR) and immobilization. It seems the Department of Energy (DOE) is already completely committed to following the dual track MOX option prior to the issuance of the Record of Decision (ROD) on this EIS (which is ostensibly to inform that decision) and prior to any substantive analysis of the impacts that the MOX option would have on specific existing reactors. 2

The evidence for this is DOE's issuance of a Request for Proposal from MOX fabricators and irradiators (reactors) and the intention to forge a contract on MOX work, possibly before the ROD is out.

It would seem that communities around the DOE sites under consideration for plutonium processing and MOX fuel fabrication can look for protection under the National Environmental Policy Act, but those who will be directly affected by the introduction of experimental, never-been-tried-before fuel in the local nuclear power reactor. This is not acceptable. (European MOX does not have gallium added, not is it pure Pu-239.) 3

It is also not acceptable the on three separate occasions members of your Office staff have offered to me the advice that reactor communities can impact the federal decision-

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FD328–1 **Alternatives**

DOE acknowledges the commentor's opposition to the MOX approach. Currently, there is no domestic or international consensus on a single approach to be employed to dispose of surplus plutonium. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again. Decisions on the surplus plutonium disposition program will be based on environmental analyses, technical and cost reports, national policy and nonproliferation considerations, and public input.

FD328–2 **General SPD EIS and NEPA Process**

DOE has prepared this SPD EIS in accordance with the provisions of NEPA (42 U.S.C. 4321 et seq.) and the related CEQ and DOE implementation regulations (40 CFR 1500 through 1508 and 10 CFR 1021, respectively). The primary objective of the EIS is a comprehensive description of proposed surplus plutonium disposition actions and alternatives and their potential environmental impacts. DOE has analyzed each environmental resource area in a consistent manner across all the alternatives to allow for a fair comparison among the alternatives and among the candidate sites for proposed surplus plutonium disposition facilities. DOE has not precluded any alternative, including immobilizing all the surplus plutonium or taking no action. A side-by-side comparison of the various alternatives are shown in Table 2–4, which summarizes the environmental impacts for all of the alternatives on an individual basis by DOE candidate site.

The SPD Final EIS was not issued until the proposed reactors had been identified and the public had an opportunity to comment on the reactor-specific information. As part of the procurement process, bidders were asked to provide environmental information to support their proposals. This information was analyzed in an Environmental Critique prepared for the DOE

source selection board prior to award of the MOX fuel fabrication and irradiation services contract. DOE then prepared an Environmental Synopsis on the basis of the Environmental Critique, which was released to the public as Appendix P of the *Supplement to the SPD Draft EIS* in April 1999. This *Supplement* included a description of the affected environment around the three proposed reactor sites, and analyses of the potential environmental impacts of operating these reactors using MOX fuel (Sections 3.7 and 4.28 of this SPD EIS, respectively). During the 45-day period for public comment on the *Supplement*, DOE held a public hearing in Washington, D.C., on June 15, 1999, and invited comments. Responses to those comments are provided in Volume III, Chapter 4. DOE will announce its decisions regarding facility siting and approach to surplus plutonium disposition in the SPD EIS ROD. As stipulated in DOE's phased contract with DCS, until and depending on the decisions regarding facility siting and approach to surplus plutonium disposition are made and announced in the ROD, no substantive design work or construction can be started by DCS on the MOX facility. Should DOE decide to pursue the No Action Alternative or the immobilization-only approach, the contract with DCS would end. The contract is phased so that only nonsite-specific base contract studies and plans can be completed before the ROD is issued, and options that would allow construction and other work would be exercised by DOE if, and only if, the decision is made to pursue the MOX approach.

FD328–3 General SPD EIS and NEPA Process

Irradiation of MOX fuel in reactors is a well–established technology with commercial application in several countries. Because MOX fuel derived from weapons–usable plutonium has not been produced on a commercial scale, DOE has conducted experiments in a test reactor to obtain detailed engineering performance information. It will also conduct a lead assembly project to ensure the availability of all information (including safety parameters) necessary to obtain a license modification for the irradiation of this specific type of MOX fuel.

As discussed in response FD328–2, the public was provided an opportunity to comment on reactor- specific information. In addition, an opportunity for public comment will likely be provided by NRC during DCS's application for

making process by intervention in the Nuclear Regulatory Commission's (NRC) license amendment process for any reactor that may use MOX fuel.

This is completely inappropriate. It is almost like saying – the automobile manufacturer doesn't have to bother with any safety analysis or tests of a completely new design of an automobile – just go ahead and build it and sell it and then we will see what happens with the local license inspection. Your office, the Secretary of Energy and the President and Vice President have the responsibility to make a decision based on information about all of the impacts that a MOX program may have. The current document is completely lacking in any consideration of the reactor impacts. 3

In a recent conversation with members of your staff, I was referred to the Programmatic Environmental Impact Statement (PEIS) on Plutonium Disposition when I raised issues associated with the use of aging power reactors for this challenging mission. A return to this document yields the comments I offer below. By the way, they left the existing civilian reactor so-called "low-level" waste out of the PEIS, no matter what the NEPA officer says! 4

I do however, want to assure you that the reactor communities across the country are well aware of their right to intervene on the license amendment process. I also want to point out that even in areas where the community is not what might be called "anti-nuclear," there is already official and documented willingness to oppose use of weapons plutonium in existing reactors. We recommend that you add this information to the uncertainty factor on any cost estimates you make for this program. 3

I would also commend to you the fact that novel procedures such as using environmental reports previously filed with the NRC that may be decades old or the invocation of "proprietary information" under a vendor procurement deal which may require that a local community has to "take DOE's word for it" will not build DOE credibility. In fact, such an approach by your office may also provide procedural loopholes that could result in administrative or legal delays. 5

We sincerely hope that your office retains and pursues its stated high level of commitment to the non-MOX options for plutonium disposition, since there is wide consensus that this disposition should proceed. 1

FOR CONSIDERATION UNDER A TRUE NEPA PROCESS:

Utilization of the environment reports filed at the time of reactor licensing may be decades out of date. What are the plans to upgrade and update this information? 6

Given the aging of nuclear reactors—including embrittlement of major components that has caused multiple reactor shut downs (permanent) well in advance of license expiration (Trojan, Yankee Rowe, Big Rock, Oyster Creek (soon), Maine Yankee to name a few in the last 5 years), combined with the environment of utility restructuring and competition 7

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the reactor operating license amendments required for each individual reactor before it can use MOX fuel pursuant to 10 CFR 50.91 should the MOX approach be selected.

FD328–4 **Waste Management**

Section 3.7 was added and Section 4.28 was revised to include information specific to operating Catawba, McGuire, and North Anna, the reactors that would use the MOX fuel.

As described in Sections 2.18.3 and 4.28.2.8, additional spent fuel would be produced by using MOX fuel instead of LEU fuel in domestic, commercial reactors. Spent fuel management at the proposed reactor sites is not expected to change dramatically due to the substitution of MOX assemblies for some of the LEU assemblies. Likewise, the additional spent fuel would be a very small fraction of the total that would be managed at the potential geologic repository.

FD328–5 **General SPD EIS and NEPA Process**

In analyzing the reactors proposed to use MOX fuel, DOE has not relied on information from the original environmental reports filed with NRC. Furthermore, DOE has withheld no information regarding reactor-specific safety analyses conducted for this SPD EIS. Those analyses are discussed in Section 4.28.2.5.

FD328–6 **MOX Approach**

The data used in the SPD EIS analyses of the reactors that would use the MOX fuel were provided by DCS and independently reviewed and verified by DOE. In addition, some information was supplemented by DOE, as discussed in Section 4.28.

The remainder of this comment is addressed in response FD328–5.

FD328–7 **MOX Approach**

The MOX approach is not intended to affect the viability of nuclear power generation at any particular reactor. The reactor owner(s) does (do) not have to continue to use MOX fuel if it determines that it is uneconomical to operate

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among electrical service providers, it is plausible (even likely) that tax-dollars for the service of plutonium irradiation will keep reactors on-line that would other-wise close.

THEREFORE, a true NEPA analysis of the existing reactor MOX option MUST include the shut-down scenario. It is not only a comparison between LEU (scenario: reactor continues to operate on LEU but all surplus plutonium is immobilized) and MOX (scenario: plutonium fuel is loaded in x many specified existing-LWRs and they get costs plus some financial benefits). It must go one step further: LEU vs MOX vs no reactor (scenario: all plutonium is immobilized and the reactor closes due to market forces). 7

In any economic analysis running parallel to the NEPA analysis, there must be a consideration of the impact of federal tax-dollar protectionism of these reactors on the utility markets that they are part of. What are the long-term environmental consequences of privileging nuclear over bio-mass, wind, solar, small hydro and energy efficiency? 8

If we assume that there will be full-core MOX, which is widely assumed by the industry, and we assume a fast thru-put rate, which will be required if predictions hold on the relatively small number of reactors that will remain viable through the entire program, then the MOX program will have extensive impact on the on-site storage of irradiated fuel. The requirement of ten years wet storage for irradiated MOX will certainly force accelerated movement of LEU fuel into dry storage. Once MOX fuel is being put in dry storage, the requirement of relatively few assemblies per container will expand the overall total number of dry casks required. 9

This NEPA analysis should consider how to factor any local or state requirements and restrictions applied to on-reactor-site interim storage. For instance, the Minnesota Supreme Court ruled that cask storage is different than pool storage and is subject to State Legislature approval. Nevada has outlawed storage and Vermont and California also have restrictions in place, to name a few. There has yet to be the constitutional test over the ability of the federal programs to override state law on behalf of nuclear enterprises. This should not be forgotten.

Does DOE intend to start steering "National Security" type arguments over civilian facilities and the communities and States that host them? If so, we had best know that now, and Governors should be advised as well. Again, it is completely unsupportable that these decisions are being made with a systematic exclusion of the reactor impacts analysis at any level where it can inform this decision, and without the active inclusion of the reactor communities. 3

USE OF A GENERIC REACTOR AS PROXY FOR SITE SPECIFIC ANALYSIS

There is no such thing as a generic nuclear power reactor. Each was built in a unique place, as a unique fabrication, and many on effectively unique designs. Over the years they have become MORE unique, as can be demonstrated by the very high percentage that are now out of compliance with their own Final Safety Analysis Report and Design 10

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the reactor. If a reactor withdraws from the team, DCS must accommodate the loss of capacity. The actions to accommodate might include changing MOX fuel loadings in the remaining reactors and finding a replacement reactor. This ensures that DOE is not driving the continuation of reactor operations solely for the surplus plutonium disposition program. Furthermore, DCS would only be reimbursed for costs that are solely and exclusively related to MOX fuel irradiation. This would ensure that the taxpayers were not underwriting otherwise uneconomical electricity-generating assets.

The purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The MOX facility would produce nuclear fuel that would displace LEU fuel that utilities would have otherwise purchased. If the effective value of the MOX fuel exceeds the cost of the LEU fuel it displaced, then the contract provides that money would be paid back to the U.S. Government by DCS based on a formula included in the DCS contract. The commercial reactors selected for the MOX approach include only those reactors whose operational life is expected to last beyond the life of the surplus plutonium disposition program. If DOE were to choose the immobilization-only approach, these reactors are expected to continue to operate using LEU fuel for at least as long as it would otherwise take to complete the irradiation of the MOX fuel. So, while this SPD EIS does consider the immobilization-only approach (Alternatives 11 and 12) advocated by the commentor, it does not analyze the environmental impacts associated with shutting down the specific reactors proposed to use MOX fuel before the end of their useful life because DOE did not choose to use MOX fuel in those reactors.

FD328–8 **Cost Report**

Because this comment relates directly to the cost analysis report, it has been forwarded to the cost analysis team for consideration. The *Plutonium Disposition Life–Cycle Costs and Cost–Related Comment Resolution Document* (DOE/MD–0013, November 1999), which covers recent life-cycle cost analyses associated with the preferred alternative, is available on the MD Web site at http://www.doe-md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS and Washington, D.C. Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose of this

Bases documents. It is not at all credible to suggest that the generic analysis provided (such as it is) in the PEIS can stand for a reactor impacts analysis.
Some reactor items which are NOT generic

Reactor design
Reactor modifications, historic and needed for MOX use
Reactor vessel chemistry
Reactor vessel and internal component aging
Irradiated Fuel storage—wet and dry status, physical, social, political
Fuel storage siting issues and authorities
So-called "Low-Level" waste disposal factors, handling, on-site issues
Transport factors
Population
Emergency planning
History of management/regulatory issues including safety factors and performance
History of emissions
Degree of extant contamination and radiological impact on humans/environment

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This is not the complete list.

The PEIS references Appendix E for information about the waste associated with the existing-LWR MOX option. Nowhere in Appendix E is the existing-LWR option listed. There is a very cursory discussion of so-called low-level (civilian LLRW includes plutonium even in class A waste, and reactor "low-level waste" may also include sludges from primary coolant and components such as steam generators and the reactor vessel as well as reactor internals that will deliver a lethal dose if unshielded) waste, associated with the Evolutionary LWR scenario There is no section on the existing-LWR option in Appendix E.

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References to reactor-site burial of such waste certainly require a site-specific analysis, not a generic dismissal. Disposal off site is simply given as the other option; end of analysis. There is no documentation of the array of radionuclides in so-called low-level radioactive waste (LLRW) that would result from irradiation of MOX fuel vs LEU fuel. There is no consideration of the environmental impacts of shipment to or emplacement of this MOX LLRW in any of the existing "low-level" unlined trench dump sites: Barnwell in South Carolina near SRS, Envirocare in Utah or Richland in Washington State next to Hanford.

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Needless to say, there is no analysis of the potential impacts of this plutonium fuel generated waste in any of the proposed new "low-level" dumps – of greatest interest being Ward Valley in California and Sierra Blanca in Texas because of the ongoing debates about whether these facilities may jeopardize major water supplied in the Colorado and Rio Grande rivers.

Another area of nuclear infrastructure completely ignored by the PEIS are all the nuclear services that reactor operators require. These include: nuclear laundries, incineration and

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proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The comparison of the environmental impacts of nuclear power with those of alternative energy sources is beyond the scope of this EIS.

FD328–9 **MOX Approach**

As discussed in Section 4.28, a partial, not full, MOX core is proposed. After irradiation, the MOX fuel would be removed from the reactor and managed with the rest of the spent fuel from the reactor, eventually being disposed of at a potential geologic repository built in accordance with the NWPA, as amended. As described in response FD328–4, additional spent fuel would be produced, but in amounts that are not expected to dramatically change the reactors' spent fuel storage plans (e.g., no new cooling ponds would be required at the proposed reactor sites). State requirements applicable to the reactors' spent fuel storage plans would be considered during the NRC operating license amendment process pursuant to 10 CFR 50.90.

FD328–10 **MOX Approach**

Reactor-specific analyses are presented in the revised Section 4.28 and replaced the generic reactor analysis presented in the SPD Draft EIS.

FD328–11 **Waste Management**

The estimated waste generation associated with the proposed reactors is discussed in Sections 3.7 and 4.28 of this SPD EIS.

FD328–12 **Waste Management**

None of the proposed reactors plan to bury LLW on the site. LLW would continue to be disposed of at offsite commercial facilities licensed by NRC. There are differences in fission product inventories and activation products between an LEU and MOX core during a fuel cycle. The only time significant quantities of fission products could be released to the environment would be in the event of a large–scale fuel leak. In regard to normal operations, FRAGEMA's (a subsidiary of COGEMA; one of the companies chosen to operate the proposed MOX facility) experience with fabricating MOX fuel indicates a leakage rate of less than one-tenth of 1 percent. FRAGEMA alone has provided 1,253 MOX fuel assemblies, with more than 300,000 fuel rods

for commercial reactor use. There have been no failures and leaks have occurred in only 3 assemblies (a total of 4 rods). All leaks occurred as a result of debris in the reactor coolant system and occurred in 1997 or earlier. The French requirements for debris removal were changed in 1997 to alleviate these concerns. Since that time, there have been no leaks in MOX fuel rods. In the event of a leaker, fission products are released into the primary containment and are ultimately either passed through a series of resins (for liquid releases) or through a HEPA filtration system (for releases to the atmosphere) that would capture approximately 99.99 percent of the radionuclides.

The use of MOX fuel would not be expected to result in any additional LLW from refuelings because the reactors would continue to operate on the same schedule as if they were using only LEU fuel.

FD328–13 **Human Health Risk**

As indicated in the revised Section 4.28 of this SPD EIS, the use of MOX fuel would not significantly change the reactor effluents or the amounts of spent nuclear fuel and wastes generated. Therefore, wastes and emissions from reactor nuclear services would not appreciably change. As such, any changes in worker and public health risk and other environmental impacts associated with these nuclear services would likely be minor.

compaction facilities for so-called "low-level" waste, decontamination services for components that are not yet considered waste and off-site storage warehouses for all of the above. The question is very real, and as yet unanswered: what does the use of MOX fuel do to the workers, the air and water emissions, and waste streams from each of these nuclear services? How does this impact the environment and public health and safety? 13

Don't the communities that affected by these nuclear service facilities have a right to this information? This information should be factored when considering immobilization only as a final track. The possibility of reactor closures should also be factored in such an analysis. What is the effect on the environment if and that plan phases or stages facilities? 3

It is ridiculous that the "criteria pollutants" for air emissions under the PEIS generic reactor analysis does not include radionuclides. No numbers are given for MOX radionuclide emissions vs LEU air emissions. It is well documented the there has been a history of fuel failure in US reactors with LEU fuel. There is evidence that European MOX fuel is more prone to cladding failure, and that Weapons Pu MOX may be even more prone to cladding failure than European MOX. The interaction of gallium and zircaloy and other factors, such as the chemistry of the core are factored into this projected incident rate. A credible analysis of the existing LWR MOX option will need to quantify this in a reasonable and defensible manner, and include it in the projected air emissions. 14

It should be noted that the generic reactor portrayed by the PEIS is based on data that is already today 6 to 10 years old. This is not going to reflect the aging issues that are coming to the forefront of reactor hazard concerns. The difference in neutron activity associated with MOX fuel also needs to be assessed for the possible contribution to further acceleration of the aging of these components, and the consequent reduction in the margin of safety at the site. 15

Additionally, there needs to be some assessment of the institutional issues. Weapons Pu-239 fuel will be a first-time experiment. What are the human factors that are affected by changing basic features of an aging system? 16

The generic reactor analysis further does not give an assessment of the source term associated with the reactor core, the fuel pool or a dry storage unit. Again, the LEU vs MOX comparison must be made, and should be compared to the shut-down reactor possibility. 7

There is ample evidence to suggest that the use of weapons plutonium MOX in existing aging light water reactors subject to utility deregulation may not only increase the probability of a major reactor accident, but would also increase the effects of such an accident, were it to happen. No where in the NEPA process to date are these issues addressed by DOE. What is the justification for taking a major federal action with such potentially grave consequences, without the least consideration of these factors? 17

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FD328–14 **Air Quality and Noise**

Section 4.28.2.4 indicates the doses from atmospheric and liquid releases that would be expected from the continued operations of the proposed reactors with MOX fuel. A plutonium-polishing process was added as a component of the MOX facility to address concerns about the presence of gallium and other impurities in the MOX fuel. Therefore, it is not expected that the MOX fuel would be more prone to cladding failure than LEU fuel.

FD328–15 **MOX Approach**

Section 4.28 of this SPD EIS was revised to provide current reactor-specific analyses and discuss the potential environmental impacts of using a partial MOX core during routine operations and reactor accidents. The higher flux associated with MOX fuel can accelerate reactor component aging. However, this would be taken into account when developing fuel management strategy, including fuel assembly placement in the reactor core. Safety issues would also be addressed during the NRC license amendment process.

FD328–16 **MOX Approach**

Some procedural modifications relating to fresh fuel handling, reactivity control, and spent fuel management may be required for the reactors using MOX fuel. None of these modifications would be expected to result in increased environmental impacts from the continued normal operation of these reactors. These changes would likely be covered in an ongoing training program for operators and would be discussed during the NRC license amendment process.

FD328–17 **Facility Accidents**

As discussed in Section 4.28.2.5, studies by NAS have led it to the following conclusion: "no important overall adverse impact of MOX use on the accident probabilities of the LWRs involved will occur; if there are adequate reactivity and thermal margins in the fuel, as licensing review should ensure, the main remaining determinants of accident probabilities will involve factors not related to fuel composition and hence unaffected by the use of MOX rather than LEU fuel." Section 4.28 was revised to include an analysis of the potential accidents and risks associated with using MOX fuel in the proposed reactors.

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Finally, there is no justification whatsoever for taking the recommendation for a linear no-threshold model for radiation dose response from the BIER-V report and then applying an arbitrary risk reduction factor to it. Indeed, real-world health studies done by credible scientists are showing a supra-linear dose-response curve, where per-unit of dose there are more health consequences in the low-dose range. 18

All taken together, we recommend that the current EIS be suspended and a design phase for this NEPA process be initiated so that there is no decision on the MOX option until these, and other concerns that may be raised by concerned citizens are addressed. 2

Thank you for your consideration.

Mary Olson
NIX MOX Campaign Coordinator
Nuclear Information & Resource Service

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The SPD Final EIS was not issued until the proposed reactors had been identified and the public had an opportunity to comment on the reactor-specific information. As part of the procurement process, bidders were asked to provide environmental information to support their proposals. This information was analyzed in an Environmental Critique prepared for the DOE source selection board prior to award of the MOX fuel fabrication and irradiation services contract. DOE then prepared an Environmental Synopsis on the basis of the Environmental Critique, which was released to the public as Appendix P of the *Supplement to the SPD Draft EIS* in April 1999. This *Supplement* included a description of the affected environment around the three proposed reactor sites, and analyses of the potential environmental impacts of operating these reactors using MOX fuel (Sections 3.7 and 4.28 of this SPD EIS, respectively). During the 45-day period for public comment on the *Supplement*, DOE held a public hearing in Washington, D.C., on June 15, 1999, and invited comments. Responses to those comments are provided in Volume III, Chapter 4.

FD328–18 **Human Health Risk**

As indicated by the commentor, the estimates of adverse health effects from radiation doses for this SPD EIS are based on the linear, no-threshold theory of radiation carcinogenesis, including the application of a dose-rate effectiveness factor (risk reduction factor). The no-threshold model postulates that all radiation doses, even those close to zero, are harmful. The approach used in this EIS, including the application of a dose-rate effectiveness factor of 2 is consistent with the recommendations made by the Committee on Interagency Radiation Research and Policy Coordination (*Use of BEIR V and UNSCEAR 1988 in Radiation Risk Assessment, Science Panel Report, No. 9*, ORAU 92/f-64, December 1992). However, it is generally acknowledged that the model results in conservative predictions of adverse health effects.

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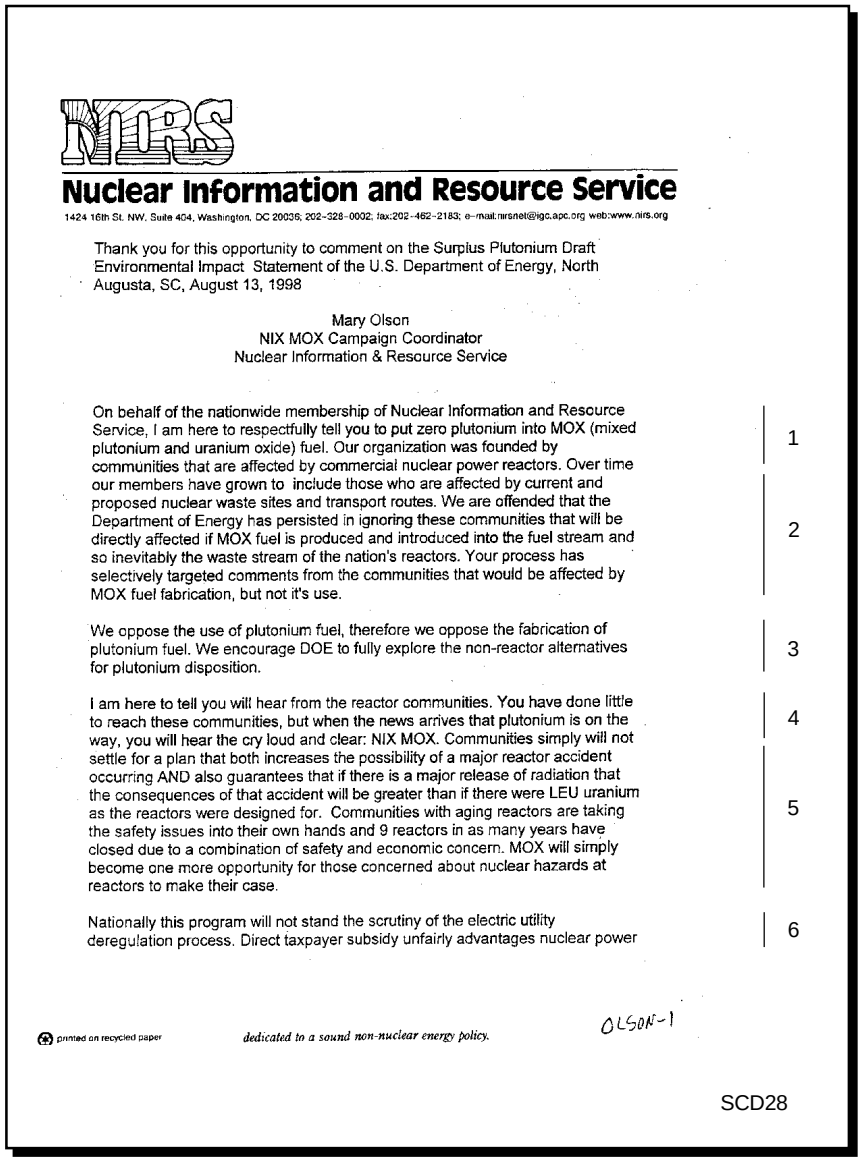

Nuclear Information and Resource Service

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Thank you for this opportunity to comment on the Surplus Plutonium Draft Environmental Impact Statement of the U.S. Department of Energy, North Augusta, SC, August 13, 1998

Mary Olson
NIX MOX Campaign Coordinator
Nuclear Information & Resource Service

On behalf of the nationwide membership of Nuclear Information and Resource Service, I am here to respectfully tell you to put zero plutonium into MOX (mixed plutonium and uranium oxide) fuel. Our organization was founded by communities that are affected by commercial nuclear power reactors. Over time our members have grown to include those who are affected by current and proposed nuclear waste sites and transport routes. We are offended that the Department of Energy has persisted in ignoring these communities that will be directly affected if MOX fuel is produced and introduced into the fuel stream and so inevitably the waste stream of the nation's reactors. Your process has selectively targeted comments from the communities that would be affected by MOX fuel fabrication, but not it's use. 1 2

We oppose the use of plutonium fuel, therefore we oppose the fabrication of plutonium fuel. We encourage DOE to fully explore the non-reactor alternatives for plutonium disposition. 3

I am here to tell you will hear from the reactor communities. You have done little to reach these communities, but when the news arrives that plutonium is on the way, you will hear the cry loud and clear: NIX MOX. Communities simply will not settle for a plan that both increases the possibility of a major reactor accident occurring AND also guarantees that if there is a major release of radiation that the consequences of that accident will be greater than if there were LEU uranium as the reactors were designed for. Communities with aging reactors are taking the safety issues into their own hands and 9 reactors in as many years have closed due to a combination of safety and economic concern. MOX will simply become one more opportunity for those concerned about nuclear hazards at reactors to make their case. 4 5

Nationally this program will not stand the scrutiny of the electric utility deregulation process. Direct taxpayer subsidy unfairly advantages nuclear power 6

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SCD28–1 **MOX Approach**

DOE acknowledges the commentor's opposition to the MOX approach to surplus plutonium disposition. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again. Decisions on the surplus plutonium disposition program will be based on environmental analyses, technical and cost reports, national policy and nonproliferation considerations, and public input.

SCD28–2 **General SPD EIS and NEPA Process**

At the time the SPD Draft EIS was issued for comment, no domestic, commercial reactors had been identified for the possible irradiation of MOX fuel.

The SPD Final EIS was not issued until the proposed reactors had been identified and the public had an opportunity to comment on the reactor-specific information. As part of the procurement process, bidders were asked to provide environmental information to support their proposals. This information was analyzed in an Environmental Critique prepared for the DOE source selection board prior to award of the MOX fuel fabrication and irradiation services contract. DOE then prepared an Environmental Synopsis on the basis of the Environmental Critique, which was released to the public as Appendix P of the *Supplement to the SPD Draft EIS* in April 1999. This *Supplement* included a description of the affected environment around the three proposed reactor sites, and analyses of the potential environmental impacts of operating these reactors using MOX fuel (Sections 3.7 and 4.28 of this SPD EIS, respectively). During the 45-day period for public comment on the *Supplement*, DOE held a public hearing in Washington, D.C., on June 15, 1999, and invited comments. Responses to those comments are provided in Volume III, Chapter 4.

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SCD28–3 **MOX Approach**

DOE acknowledges the commentor's support for the immobilization-only approach. DOE considers the use of a nonreactor alternative in Alternatives 11 and 12, immobilization of all the surplus plutonium.

SCD28–4 **MOX Approach**

This comment is addressed in response SCD28–2.

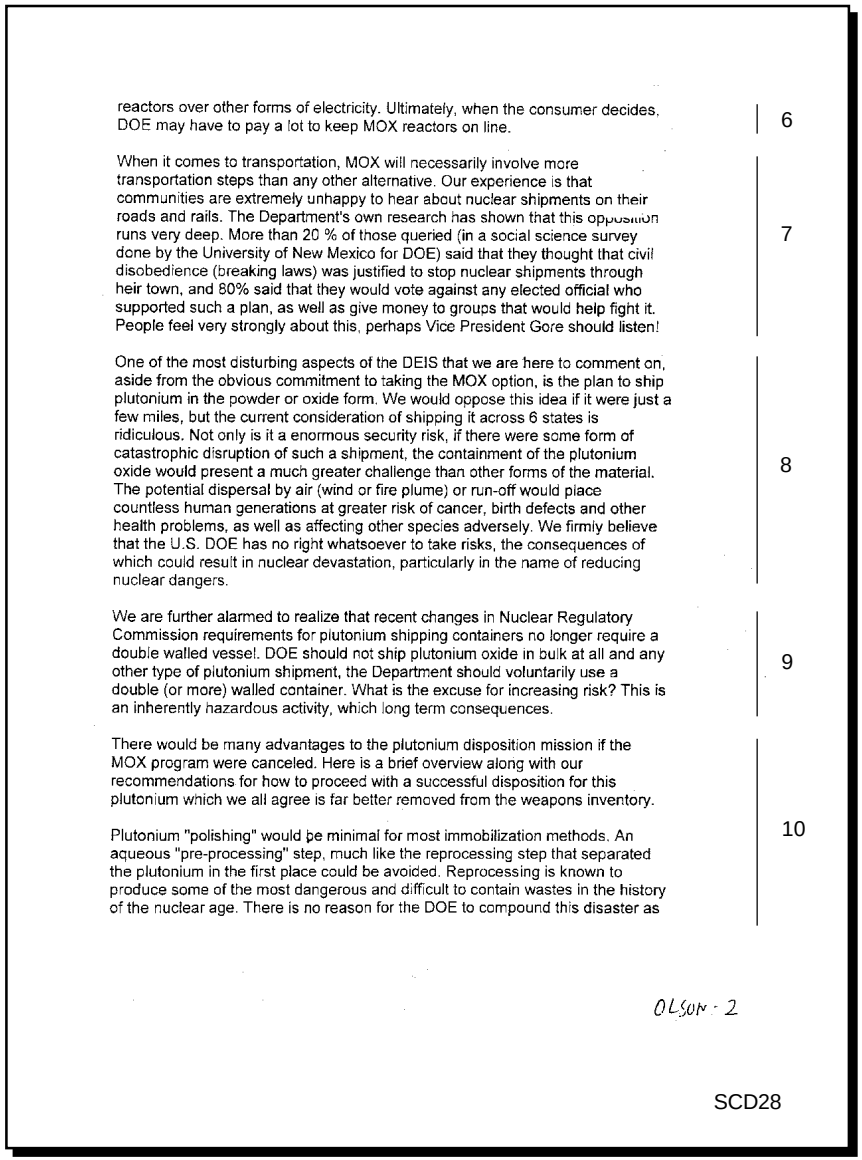
SCD28–5 **Facility Accidents**

Section 4.28 was revised to provide reactor-specific analyses and discuss the potential environmental impacts of using a partial MOX core during routine operations and reactor accidents. The commercial reactors selected for the MOX approach include only those reactors whose operational life is expected to last beyond the life of the surplus plutonium disposition program.

SCD28–6 **MOX Approach**

Use of MOX fuel in commercial reactors is not proposed in order to subsidize the commercial nuclear power industry in the event of deregulation. Rather, the purpose of this proposed action is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard. The Spent Fuel Standard, as identified by NAS and modified by DOE, is to make the surplus weapons-usable plutonium as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors.

Consistent with the U.S. policy of discouraging the civilian use of plutonium, a MOX facility would be built and operated subject to the following strict conditions: construction would take place at a secure DOE site, it would be owned by the U.S. Government, operations would be limited exclusively to the disposition of surplus plutonium, and the MOX facility would be shut down at the completion of the surplus plutonium disposition program. For reactor irradiation, the NRC license would authorize only the participating reactors to use MOX fuel fabricated from surplus plutonium, and the irradiation would be a once-through cycle with no reprocessing.



reactors over other forms of electricity. Ultimately, when the consumer decides, DOE may have to pay a lot to keep MOX reactors on line. 6

When it comes to transportation, MOX will necessarily involve more transportation steps than any other alternative. Our experience is that communities are extremely unhappy to hear about nuclear shipments on their roads and rails. The Department's own research has shown that this opposition runs very deep. More than 20 % of those queried (in a social science survey done by the University of New Mexico for DOE) said that they thought that civil disobedience (breaking laws) was justified to stop nuclear shipments through heir town, and 80% said that they would vote against any elected official who supported such a plan, as well as give money to groups that would help fight it. People feel very strongly about this, perhaps Vice President Gore should listen! 7

One of the most disturbing aspects of the DEIS that we are here to comment on, aside from the obvious commitment to taking the MOX option, is the plan to ship plutonium in the powder or oxide form. We would oppose this idea if it were just a few miles, but the current consideration of shipping it across 6 states is ridiculous. Not only is it a enormous security risk, if there were some form of catastrophic disruption of such a shipment, the containment of the plutonium oxide would present a much greater challenge than other forms of the material. The potential dispersal by air (wind or fire plume) or run-off would place countless human generations at greater risk of cancer, birth defects and other health problems, as well as affecting other species adversely. We firmly believe that the U.S. DOE has no right whatsoever to take risks, the consequences of which could result in nuclear devastation, particularly in the name of reducing nuclear dangers. 8

We are further alarmed to realize that recent changes in Nuclear Regulatory Commission requirements for plutonium shipping containers no longer require a double walled vessel. DOE should not ship plutonium oxide in bulk at all and any other type of plutonium shipment, the Department should voluntarily use a double (or more) walled container. What is the excuse for increasing risk? This is an inherently hazardous activity, which long term consequences. 9

There would be many advantages to the plutonium disposition mission if the MOX program were canceled. Here is a brief overview along with our recommendations for how to proceed with a successful disposition for this plutonium which we all agree is far better removed from the weapons inventory. 10

Plutonium "polishing" would be minimal for most immobilization methods. An aqueous "pre-processing" step, much like the reprocessing step that separated the plutonium in the first place could be avoided. Reprocessing is known to produce some of the most dangerous and difficult to contain wastes in the history of the nuclear age. There is no reason for the DOE to compound this disaster as

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SCD28–7 **Transportation**

DOE acknowledges the commentor's concern about public reaction to the transportation of nuclear material. The hybrid alternatives in this SPD EIS would require more transportation than the immobilization-only alternatives as shown in Section 2.18 and Appendix L.

SCD28–8 **Transportation**

Table L-6 summarizes the analysis of risks attributed to alternatives that involve transportation of nuclear materials. The Type B packages that would be used to transport radioactive material are designed to withstand test conditions described in Appendix L.3.1.6, which represent extremely severe accidents (estimated to be more severe than over 99 percent of all accidents that could occur). Type B packages have been used for years to ship radioactive materials in the United States and around the world. To date, no Type B package has ever been punctured or has had its contents released, even in actual highway accidents. As described in Appendix L.3.1.6, the Type B package is extremely robust and provides a high degree of confidence that even in extremely severe accidents, the integrity of the package would be maintained with essentially no loss of the radioactive contents or serious impairment of the shielding capability. As discussed in Section 2.18, no traffic fatalities from nonradiological accidents or LCFs from radiological exposures or vehicle emissions are expected. DOE's decision will be based on analysis in this SPD EIS and will include consideration of public comments.

SCD28–9 **Transportation**

Appendix L contains information on the shipping containers that would be used to transport plutonium. Transportation of the plutonium material would use DOE's SST/SGT system. Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents causing a fatality or release of radioactive material. Under NRC regulations (10 CFR 71), plutonium in excess of 20 Ci per package must be packaged in a separate inner container placed within an outer container (i.e., double-walled system). This requirement would apply to DOE shipments of surplus plutonium.

SCD28–10 **Alternatives**

DOE is not considering reprocessing any surplus plutonium from spent nuclear fuel; plutonium polishing is not reprocessing and would be a relatively small component of the MOX facility. As described in the Waste Management sections in Chapter 4 of Volume I, the wastes generated would not have a major impact on waste management resources at any of the candidate sites. If Pantex were chosen as the site for any of the proposed surplus plutonium disposition facilities, additional LLW and TRU waste capabilities may be required, as discussed in the appropriate sections in Chapter 4 and Appendix H.3. DOE also appreciates the commentor's concern regarding environmental consequences of surplus plutonium disposition activities. As described in Chapter 4 and summarized in Section 2.18, potential impacts to the public from any of the proposed activities during routine operations at any of the candidate sites would likely be minor. To avoid contamination that has occurred in the past at some DOE sites, DOE would design, build, and operate the proposed in compliance with today's environmental, safety, and health requirements.

Although cost will be a factor in the decisionmaking process, this SPD EIS contains environmental impact data and does not address the costs associated with the various alternatives. A separate cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons–Usable Plutonium Disposition* (DOE/MD-0009, July 1998), which analyzes the site–specific cost estimates for each alternative, was made available around the same time as the SPD Draft EIS. This report and the *Plutonium Disposition Life–Cycle Costs and Cost–Related Comment Resolution Document* (DOE/MD-0013, November 1999), which covers recent life–cycle cost analyses associated with the preferred alternative, are available on the MD Web site at http://www.doe–md.com and in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington D.C.

Commercial reactors currently have armed security forces, primarily to protect against perimeter intrusion. There would be increased security for the receipt and storage of fresh MOX fuel, as compared with that for fresh LEU fuel, for additional vigilance inside the perimeter. However, the increased security surveillance would be a small increment to the plant's existing security plan.

The remainder of this comment is addressed in responses SCD28–7, SCD28–8, and SCD28–9.

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is already evident in the environmental devastation of nuclear pollution here at and around Savannah River Site and the Hanford Reservation.

Fewer facilities would have to be built, reducing the coat as well as the inevitable difficulty associated with approvals, licenses and such.

Plutonium would travel less. Nuclear Information and Resource Service is not taking a position on where the immobilization program should be pursued, or even if it should be done in one place. Nonetheless, it is pretty obvious that weapons-usable material would be transported less and spend more time within the boundaries of the DOE complex than in the MOX option. Before it is fissioned in the reactor core MOX fuel is still weapon's usable, requiring only reprocessing technology, not enrichment. Thus it would require national security level security in transport. 10

Further, there would have to be the same level of security instituted at reactor sites. We object to DOE endowing private security services in our communities with a shoot-to-kill authority.

Obtaining reactor license amendments for this new fuel type will offer the opportunity to review the reactor safety systems and also t he aging issues inherent in the long-term exposure to he heat and radiation of LEU uranium fuel. The increased capacity of plutonium fuel to age components, particularly in the full-MOX cores that the Department seems to be assuming in the DEIS, will provide a wonderful opportunity to target reactors for early closure. 11

On the waste front, immobilization also offers the Department some relief, since the storage of an immobilization end-product can be designed from the ground-up to be appropriate for this new waste type. In contrast, irradiated MOX fuel in the hands of nuclear utilities that are already facing challenges of waste storage is a very different picture. Over-filled fuel pools, many already strained far beyond their original design capacity will not be easier to manage with the greater thermal and criticality factors, as well as cladding stress issues that MOX will introduce. If dry storage is in use at the time that MOX waste would be moving out of the fuel pools, attempted use of current cask designs may also result in problems that will be the Department's to deal with at some point. What is going to become of all that damaged fuel if we ever do have a repository? 12

All this spells more expense, more regulatory and administrative combat with local communities and ultimately if great care is not take and more money is not spent, far greater environmental impact than a system that is designed specifically for the unique aspects of plutonium wastes.

The list of all the reasons MOX is a bad idea goes on, and we will supplement these oral comments with further written comments. The bottom line is that MOX will cost a tremendous amount of money to do at all, and then it will cost even

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SCD28–11 **NRC Licensing**

The higher flux associated with MOX fuel can accelerate reactor component aging. However, this is taken into account when developing fuel management strategy, including fuel assembly placement in the reactor core. The proposed action anticipates partial, not full, MOX cores in the selected reactors. This issue, along with other issues important to safety, would be addressed during the NRC license amendment process.

SCD28–12 **Waste Management**

As described in Sections 2.18.3 and 4.28.2.8, additional spent fuel would be produced by using MOX fuel instead of LEU fuel in domestic, commercial reactors. Spent fuel management at the proposed reactor sites is not expected to change dramatically due to the substitution of MOX assemblies for some of the LEU assemblies. Likewise, the additional spent fuel would be a very small fraction of the total that would be managed at the potential geologic repository. MOX fuel would be handled the same as other fuels with regard to pools and dry casks. MOX fuel assemblies would be the same size and shape as the LEU fuel for the specific reactor. The only difference would be the additional decay heat from the higher actinides, especially americium, in the MOX fuel. Dry casks are designed and certified for a maximum heat load, so the additional decay heat would contribute to the total heat load and not require any redesign. The additional heat load may result in less spent fuel stored per cask. A more likely option is that the MOX fuel would be selectively packaged with cooler LEU fuel to obviate any overall heat output restriction. As a result, DOE does not expect any changes in the cask design. An amendment to the Certificate of Compliance for the cask, and the reactor operating license, would be needed to include storage of MOX fuel assemblies.

The remainder of this comment about cost is addressed in response SCD28–10.

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more to deal with the legal and administrative aspects of trying to oppose the people you serve, and then it will cost even more than that, since the probability of a real problem at some point are not our imagination, but rather based on 50 years of experience with the Department and three decades of suffering reactor operation. 12

Recommendations for responsible immobilization of surplus weapons plutonium.

The Department must insure a zero release policy for every site where plutonium is handled. There is no acceptable amount of this material in the environment, in our bodies, in our food, in our air in our water.

This means that there has to be a plan for ALL the waste at every step to insure that it is tracked into 100% containment, and that there is no idea that it is OK to vent.

The Department should insure that state of the art monitoring will instituted -- with redundancy to insure that this policy is in-force at all times. One of the monitoring systems should be administered completely in the control of the local community. 13

This means that there is a commitment to zero dose to the public in this process.

The Department should institute a low as achievable dose policy for workers. This is NOT ALARA -- remove the word "reasonably" before achievable. Cancel MOX and spend the money you would save on meeting these goals, and there will be far greater acceptance of plutonium disposition mission in whatever community you approach to host this vital contribution to the welfare of our planet.

Equally Important to protecting the people and the environment from DOE's plutonium handling is the security of this vulnerable material. We recognize that steps must be taken to insure that this material is not diverted. At the same time this must not be at the expense of an open and accessible information base to insure that environment and safety commitments are being met. 14

Thank you.

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SCD28–13 **DOE Policy**

The health and safety of workers and the public is a priority of the surplus plutonium disposition program, regardless of which approach is chosen. Operation of the proposed surplus plutonium disposition facilities would comply with applicable Federal, State, and local laws and regulations governing radiological and hazardous chemical releases. Within these limits, DOE believes that the level of contamination should be kept as low as is reasonably achievable, so that the benefit of reducing the already low level of contamination would warrant the additional cost of that reduction. Chapter 5 summarizes the applicable environmental statutes, regulations, and permits that cover emissions, waste, and ALARA standards.

SCD28–14 **DOE Policy**

DOE acknowledges the commentor's concern about the security of plutonium materials. The proposed DOE surplus plutonium disposition facilities are all at locations where plutonium would have the levels of protection and control required by applicable DOE safeguards and security directives. Safeguards and security programs would be integrated programs of physical protection, information security, nuclear material control and accountability, and personnel assurance. Security for the proposed facilities would be implemented commensurate with the usability of the material in a nuclear weapon or improvised nuclear device. Physical barriers; access control systems; detection and alarm systems; procedures, including the two-person rule (which requires at least two people to be present when working with special nuclear materials in the facility); and personnel security measures, including security clearance investigations and access authorization levels, would be used to ensure that special nuclear materials stored and processed inside are adequately protected. Closed-circuit television, intrusion detection, motion detection, and other automated materials monitoring methods would be employed. Furthermore, the physical protection, safeguards, and security for the MOX facility and domestic, commercial reactors would be in compliance with NRC regulations. International inspections of the proposed facilities would be conducted strictly by procedure so as not to compromise security. None of the policies, programs, or procedures implemented for safeguarding this material would inhibit compliance with safety or environmental regulations.